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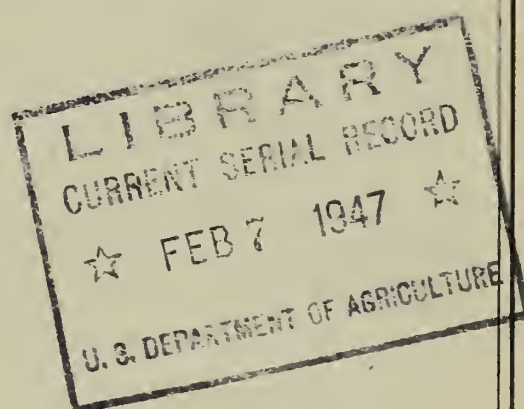
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WASHINGTON, D. C.

LAYOUT AND OPERATIONS  
OF COOPERATIVE POULTRY  
DRESSING PLANTS



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UNITED STATES DEPARTMENT OF AGRICULTURE  
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## SUMMARY

1. Thirteen farmers' cooperative poultry dressing plants were visited in order to study factors of an engineering nature dealing with plant design and operations.
2. The plants studied ranged in size from those which can turn out approximately 500 to those turning out 3,000 dressed birds per hour.
3. Plants studied in the Midwest are multi-story structures. In addition to dressing poultry, they handle eggs and other farm products. These plants dress a larger percentage of mature birds than those in the broiler section of the South Atlantic States.
4. In the broiler areas in the South Atlantic States, single-story structures predominate. Plant operations are generally confined to dressing broilers and fryers (springs).
5. In New England, two-story structures are favored for dressing plants. They are customarily operated in conjunction with some other business.
6. Large poultry dressing establishments have receiving, holding and feeding, dressing, and packing departments, each under the supervision of a foreman.
7. In processing chickens, mostly broilers and fryers, the plants studied averaged 23.2 birds per hour for each worker; in packing, the average was 96.6. From one-fourth to one-sixth as many turkeys as chickens can be dressed in an hour with the same equipment and crew.
8. The performance of individuals and crews, particularly in packing, depends largely upon the convenient arrangement of materials and supplies, the speed at which the workers move, and the skill previously acquired.
9. The duration of the feeding period at a plant prior to dressing and the use of wax are controversial questions. There are plants operating successfully with no feeding at the plant and some with extensive feeding. There are high and low production plants with and without the use of wax.
10. A crew of 40 is customarily associated with one Federal inspector in eviscerating and packing 720 fowl per hour when the birds are not cut up. Somewhat more young chickens (broilers) are permitted.
11. The added operation of drawing reduces the number of birds processed by the same crew about 30 to 35 percent.
12. The cost of plants studied with operations confined to poultry dressing constructed during the period 1943-45 ranged from \$40,000 to \$500,000. Processing equipment for a plant dressing 1,000 to 1,500 birds per hour with batteries for 3-day holding and vat chilling costs at least \$25,000.

13. A poultry dressing plant with a capacity of 1,000 to 1,500 dressed birds per hour requires about 100 employees for all operations including management and supervision.

14. Research work is needed to develop new methods and principles for removing feathers from poultry and to improve chilling and packing practices in order to reduce the unit cost of labor.

# LAYOUT AND OPERATIONS OF COOPERATIVE POULTRY DRESSING PLANTS

By

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in cooperation with  
Farm Credit Administration

During the past 10 years there has been a large increase in the number of chickens dressed at poultry dressing plants in the commercial broiler producing areas. The volume was accelerated by the war which greatly stimulated the poultry industry. As a result the number of poultry dressing plants, particularly in Delaware, Maryland, and Virginia, increased. In these States poultry became a leading agricultural enterprise as both production and processing were commercialized. Producer groups, local businessmen, chain grocery firms, and large meat packers participated, and plants of a great variety of types and sizes were constructed.

While the procedure and problems in dressing poultry are similar throughout the country, the development on the Del-Mar-Va Peninsula, which comprises the greater part of Delaware, the Eastern Shore part of Maryland, and one county of Virginia, is unique in that eggs for hatching of baby chicks, feed for young chickens, and equipment for production and processing are brought in from other States. It also differs from most other areas in that practically all the chickens processed are broilers or fryers (springs) only 14 to 18 weeks old. Young chickens are referred to in this report either as springs or broilers.

In the Midwest, chickens are either a farm sideline or are kept principally for egg production. For these reasons processing plants dress a larger percentage of mature birds (fowl) than in the South Atlantic States. In the Midwest springs are, as a rule, heavier when marketed than in the East. In the New England and Middle Atlantic States hatchery egg production is important. In some areas in these States processing plants are operated merely to dispose of birds not suited to egg production. Some plants near large cities cater to hucksters.

The volume of poultry purchased by the armed forces declined when the war ended. Scarcity and high price of feed and high cost of labor increased the cost of production and processing. As the margin of profit narrowed, efficiency in processing became more important. To assist processors in reducing cost the Farm Credit Administration, in cooperation with the Bureau of Plant Industry, Soils, and Agricultural Engineering, planned a study of processing costs and of plants and equipment. It

Note: This study was made under the supervision of John J. Scanlan, In Charge, Poultry Section, Cooperative Research and Service Division. Illustrations of floor plans studied and design of suggested layouts were prepared by Walter G. Cadmus, Jr., Architect, Bureau of Plant Industry, Soils, and Agricultural Engineering. Some of the photographs used were obtained from the Poultry Branch, Production and Marketing Administration.

was felt that cost records, coupled with detailed information on plant design and operations, might be of considerable value to the industry. While it was not possible to carry out the cost study, information on operations and equipment was obtained during the winter of 1945 from 13 farmers' cooperative plants, one in North Carolina, one in West Virginia, three in Virginia, four in Maryland, one in Pennsylvania, one in Massachusetts, and two in Missouri. Visits also were made to two other plants in Maryland, four in Delaware, one in New York, one in Massachusetts, and one in Missouri.

### PROCESSING PLANTS

In the Midwest poultry processing is generally associated with handling eggs, at least in the farmers' cooperative plants in Missouri. Frequently, handling eggs is more important than processing poultry. The buildings occupied were often originally designed for some purpose other than for poultry and eggs. They are generally two or more stories and are located within city limits. For new plants, a one floor and basement layout would appear desirable for poultry processing and egg handling.

The plants studied in the New England and Middle Atlantic States designed for poultry processing indicate a preference for two-story brick or concrete block structures located on a hillside or ramped for loading or unloading on either floor. Such a design has a decided advantage for the Northeast. The cost of construction is probably less for the floor area obtained with two stories than with one and the building is easier to heat. Chickens are received and fed on the second floor. All processing operations are performed on the first floor or basement.

The Del-Mar-Va Peninsula plants visited were mostly frame buildings of one floor at ground level. However, brick or concrete structures and plants with dock-level floors are not uncommon. The plants studied in the Shenandoah Valley of Virginia were all two or more stories but only one plant was originally designed for poultry dressing. These plants receive and hold poultry on the second floor and dress it on the first floor or in the basement. In one case the slope of the site is such that live poultry is received at one end of the building at dock height and the dressed birds are loaded out from the basement at the other end also from a platform. One plant has a street level receiving platform and low ground at one side in the rear permits the loading out of dressed poultry directly from the basement. A third plant with two floors and a basement uses a freight elevator for loading out dressed birds from the basement. In all plants visited where poultry is dressed in the basement, the killing line extends to the first floor where the live chickens are shackled.

The only plant studied in West Virginia was a one-story structure designed as a dressing plant. The North Carolina plant was one story and was not originally designed for poultry.

If one might generalize, a typical Midwest poultry dressing plant would be a warehouse type structure of two or more floors where both eggs and

poultry are handled. Plants in the Northeast are likely to be two stories and handle eggs also. Plants in the South Atlantic States are generally one-story structures confined to poultry dressing.

The plants studied range in size from a rated capacity of approximately 500 to 3,000 dressed springs per hour. The Del-Mar-Va plants are, as a rule, of greater capacity than those in other areas where studies were made.

Dressed poultry - sometimes called New York dressed, hog dressed, or blood-and-feather dressed - in this report refers to birds with feathers removed but with head, feet, and visera intact.

### OPERATIONS

The organization for the supervision of a poultry dressing plant is similar to that of any other processing business and varies from plant to plant depending upon circumstances. Large plants confined to poultry dressing frequently have a general manager and a plant superintendent. A foreman or manager for each of the major departments, receiving, holding and feeding, dressing, and packing, under the plant superintendent, is customary. Small plants sometimes have a foreman for two or more departments. Most plants in the East have a poultry buyer and some have an office manager.

Getting the chickens to the plant from the producer and transferring them to feeding batteries is one of the first headaches. Custom hauling is somewhat hazardous in view of the scarcity of labor. It requires a crew paid by the processor at the plant at all times ready to unload promptly when a load arrives. Delivery by plant-owned trucks and crews usually works out satisfactorily but the trucks are expensive and hard to get. Weighing on the farm also complicates the problem as producers in most areas will accept only farm weights. The birds not only lose weight in hauling but some are killed either by smothering or by rough handling. Records obtained on 31 loads of springs at one plant showed an average of nearly 12 killed for each load of 2,500 to 3,000 birds.

The question as to whether to feed chickens, young chickens in particular, at the plant for several days before dressing or to kill them immediately is discussed widely. There has been a tendency during recent years to reduce the time birds are held at the plant, doubtless due in part to reportedly high-priced, low-quality feed and to difficulties in obtaining satisfactory labor for feeding. Some plant operators say that to feed or not to feed for several days depends upon the feeder. Experienced feeders can, they say, determine in short order which lots it is profitable to feed and which to kill immediately. Such statements indicate that some chickens respond favorably to feed in the plant and some do not. For this reason, any statement in reference to feeding should be modified accordingly. Some plants do no feeding and others hold birds for a week or more. However, most operators like to have space, batteries, and equipment for holding and feeding for about 3 days, counting the day the birds are received and the day they are killed.

Even for those who make a practice of killing immediately, it is well to have a few batteries for holding over weekends.

Dressing is a production line operation and is done rather efficiently. However, one gains the impression that far too many people are required despite mechanization of certain operations. The bird is first shackled by hand to a moving endless chain from a feeding battery or from a coop. The shackles are heavy wire loops which hold the bird's feet under spring tension. The bird then moves on continuously to the killer who cuts its throat or severs the jugular vein with a knife through the mouth. At some plants the brain is punctured during the sticking operation and at others brain piercing is a separate operation. The idea of puncturing the brain is to relax the muscles as an aid in removing the feathers and to prevent flopping. Some operators say that piercing the brain to sever certain nerves helps greatly in dressing and others say it is of no practical value when scalding is done at a temperature of  $128^{\circ}$  to  $132^{\circ}$  F. Devices in which an electric current is used for shocking the bird and thereby relaxing the muscles have been developed and used but none of the plants studied have them.

From the killer, the birds are conveyed next to a scalding tank where water is maintained at from approximately  $128^{\circ}$  to  $132^{\circ}$  F. depending upon the chickens and the speed of the line. Workmen, known as roughers, are usually stationed near the discharge end of the scalding tank to remove wing and tail feathers. These feathers not only come out easier immediately after scalding but the picking machines do better work in removing body feathers when the wing and tail feathers are out of the way. If two or more mechanical pickers are used, roughers also may be stationed between the first and second machine or all wing and tail pulling may be done between the machines.

Most plants have one or more buffers in addition to the automatic picking machine. These buffers have a revolving drum in horizontal position with protruding rubber strips or fingers against which an operator manipulates the bird. After the bird passes through a picking machine or two and over several buffers most of the body feathers have been removed. A band of feathers around the shank, some on the neck near the head, some back feathers, pin feathers, and some wing feathers remain. Workmen known as pinners, usually women, remove these feathers by hand. At several plants the birds are reversed, heads hung from shackles between the two automatic pickers, and again reversed before pinning.

Some managers prefer to assign certain employees to remove feathers from specific parts of the body such as the wings, shanks, and neck. At other plants, a pinner finishes cleaning a chicken from head to foot. At most plants the pinners follow the birds along until the job is completed. At one or two plants the pinners sit or stand in one place and work on the chickens as they pass. According to the information obtained and observations made, these methods are a matter of preference and probably make very little difference in the number of chickens pinned in

a day by a worker. Time and motion studies might, however, reveal advantages for certain procedure. On a fast line, a pinner sitting or standing in one place can do little work on a bird while it is passing.

After a bird is pinned, the vent and craw are emptied and the chicken inspected and singed. Singeing is usually done between gas jets as the bird moves along the line. One plant used a hand singer which probably does a better job but requires an operator. Following the singeing operation, most plants passed the bird through a water spray chamber. After this washing the birds are removed from the line and hung on racks for cooling in a chill room or placed in vats for chilling in ice water.

The common practice in the Midwest is to chill the birds on racks in a room at a temperature from 34° to 36° F. Under such conditions a period of 3 to 7 hours is required to bring the temperature down to about 40° F. for springs, according to studies made by the Iowa State College and the University of Missouri.<sup>1</sup> The exact time required at a given temperature depends largely upon the size of the bird and the air circulation.

With the wet system, a common practice in the East, concrete vats with or without wire baskets, portable or stationary steel vats, or portable or stationary barrels (hogsheads) are used. Water and ice are added as the vat is filled with chickens. In most cases to hasten chilling the water is agitated by admitting air under pressure at several points in the bottom of the container. A period of 1 to 2 hours is reported for chilling springs in agitated ice water, depending upon the size of the chicken.

After chilling, by either air or ice water, the birds are ready to pack as dressed poultry or to move on to any other processing operation which may be desired.

Each chilling or cooling method has advantages and disadvantages. Air chilling is probably more sanitary than icing in vats and apparently requires less labor. More expensive equipment is needed and a longer period of time required in a room than with ice water, and the birds lose weight due to drying while cooling in air. In ice water chilling the birds gain in weight slightly and the time required to chill is only an hour or so for springs, compared with 3 to 7 hours in air. The ice method is messy in that melting ice and water from the wet chickens keep the floor in the packing room wet most of the time. Ice in the quantities needed is sometimes hard to get during hot weather but a few plants have installed ice-making equipment.

Perhaps one of the main reasons for the difference in methods of chilling between the Midwest and the East is due to marketing practices. Freezing the birds for shipping is a common practice in the Midwest and this requires a "dry pack." In the East, the birds are customarily iced as they are packed for shipment as the distance to market is usually

<sup>1</sup>Sweet, M. H., and Stewart, G. F., Refrigerated Brine Sprays for Cooling Dressed Poultry. Iowa Agr. Expt. Sta. Journal Paper No. J-1004, Project No. 663. (In U. S. Egg and Poultry Magazine 48 (1942) 261-265, 308-313) Williams, I. L., and Funk, E. M., Factors Affecting Temperature Changes in Dressed Poultry During Refrigeration. Univ. of Missouri Res. Bul. 334, 39 pp. 1941.

short. The boxes or barrels of iced birds drip water in handling and cold storage plants object to the "wet pack" because of the hazard when the water freezes on the floor. When water chilled birds are frozen, ice is omitted in packing.

Drawing poultry, removing the head, feet, craw, vent, and all internal organs which come out readily with the intestines is done in several plants where studies were made. The birds are drawn warm on the dressing line, or after chilling on tables, or on a separate line.

Drawing on the dressing line requires the least amount of special equipment and the same crew is used as for dressing. The number of birds dressed and drawn per hour, however, is much less with the same crew than for dressing only. Also the drawing operation is reported to be easier with chilled birds than with warm birds. This is especially true if the chickens are mature and fat. Health and sanitation authorities may also frown upon vat chilling of birds after drawing on the line. Room chilling of drawn birds or chilling in vats before drawing should not meet with this objection, however.

As previously stated, drawing on a table or on a separate line after chilling requires extra equipment and crew. The practice does permit a plant to turn out both dressed and drawn poultry at the same time. With this procedure the birds are graded before drawing and a better selection can be made as to which to draw and which to pack as dressed birds. On-the-line drawing, either killing line or separate line, is probably better than on the table from an operation standpoint. The removal of offal is facilitated and more birds can probably be drawn by a worker in an hour on a line than on a table.

The great majority of plants visited, which now do no eviscerating, contemplate getting a room ready and installing the necessary equipment despite scarcity and high cost of equipment, the need for a large labor force, and the cost of a Federal inspector. While Federal inspection for eviscerated poultry is not mandatory, several of the large terminal markets require it. The assurance of the public of a wholesome product is doubtless worth the inspection cost in selling this rather high-priced product. The per pound price to the consumer is high because the meat is fully prepared for cooking. The feathers, head, shanks, crop, oil gland, and all internal organs have been removed. It should also be borne in mind that while the cost per pound of eviscerated poultry is higher than dressed poultry there may be little difference in the actual cost of the meat per pound. A larger crew is required to eviscerate, cut up, and pack 700 to 800 birds per hour than would be needed to operate an entire plant of comparable capacity for dressed chickens. Dressed birds are bled and have the feathers removed but the head, feet, and viscera are intact.

Federal inspection is under the direction of the Production and Marketing Administration of the U. S. Department of Agriculture. Certain rules and regulations are effective as to sanitary requirements of buildings and equipment in connection with the service.

Eviscerated poultry is packed in various ways. It is cut up and packaged with all parts of one bird in a box; it is cut up and the individual parts assembled for sale to customers in retail stores; the individual parts of a number of birds are put in one container for use by institutions, canning factories, soup manufacturers; or, the bird is packed whole with giblets separate for institutions or soup making.

## MACHINERY AND EQUIPMENT

### COOPS

Coops used for transporting chickens from the farm to the plant vary in size and in materials used in construction. Those observed in the East are mostly wood and approximately  $12\frac{1}{2}$  inches high,  $23\frac{1}{4}$  inches wide, and  $35\frac{1}{4}$  inches long, outside dimensions. A small door in the center of the top just large enough for removing one bird at a time is designed for quick opening and closing. The bottom of the coop is solid and openings between boards or rods which form the sides and top are wide enough for springs to poke their heads through. Plants usually recommend 14 springs

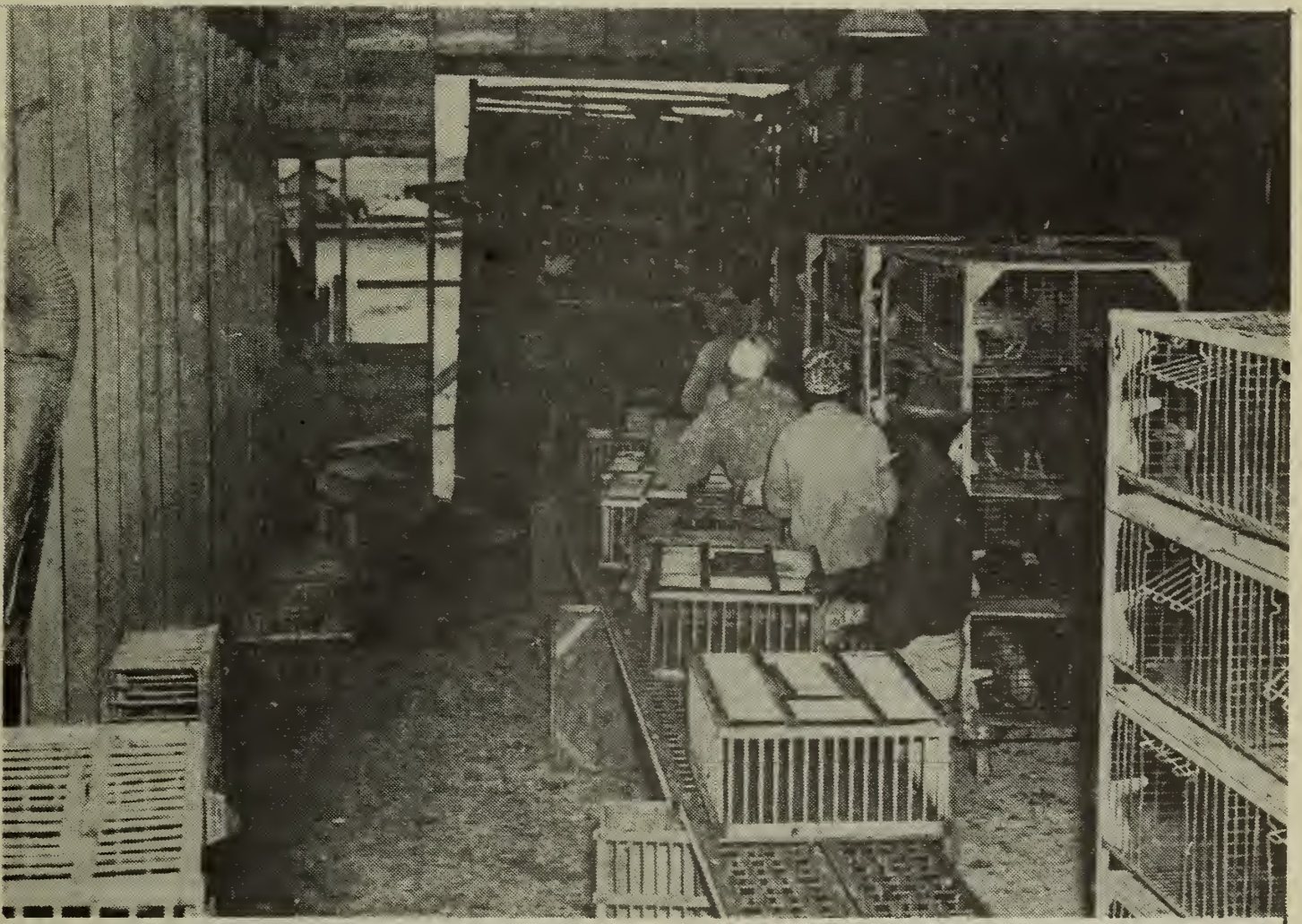


Figure 1. - Chickens are transferred from coops to feeding batteries when they arrive at the poultry processing plant.

per coop in hot weather and 18 in cold. Counts made at several plants indicate that 20 birds may be placed in each coop at times during the winter months.

Coops observed at plants in Missouri are larger than those in the East, of heavier construction, and have two compartments. They measure approximately 13 inches high, 30 inches wide, and 47 inches long, outside dimensions, and hold from 20 to 30 birds. No special door is provided but one slat in the top is loose. A metal strip binder across the top of the coop in the center prevents the loose board from falling off. This board is pushed endwise to open up either of the two compartments. A thin piece of board is used for holding the loose slat in place for transporting the coop. The thin board is placed across the loose slat with ends under adjacent slats.

### BATTERIES

Feeding batteries in most of the plants are approximately 3 feet wide, 5 feet long, and 7 feet high, overall dimensions. They consist of four wire coops, one above the other supported at the corners by angle irons and mounted on wheels. Each coop is divided into four sections making 16 compartments for the battery. When feeding troughs are attached, the overall width is increased to about 4 feet. The exact overall height depends upon the diameter of the wheels on which the battery is mounted.

For feeding and holding, the batteries are lined up in rows on 7-foot centers. The arrangement provides a 3-foot passage between each row for filling the feed troughs and for inspecting the birds. Windows are



Figure 2. - A typical feeding and holding room with batteries lined up at right angles to a center aisle.

often installed on 7-foot centers in the feeding room to accommodate this spacing of batteries.

Some plants recommend 112 springs per battery for feeding during the summer and 128 per battery during the winter. Other feeders recommend 96 to 128 springs per battery, depending upon the weather. Counts of chickens placed in batteries indicate that the actual number usually falls within the 96 to 128 range.

#### FEED MIXERS

The feed mixers observed were of the wet mix batch type and were located at a convenient point in the plant near the feed supply. A mash, mixed according to formula, is transported to the several lines or rows of feeding batteries in tanks mounted on wheels. These tanks, as well as the mixers, are equipped with molasses-type gate valves. Feed cans, which are similar to a garden sprinkler with the sprinkler head removed, are used for pouring the feed into the troughs on the batteries. The mixers of the type commonly used mix several hundred pounds of mash per batch and are equipped with an electric motor, usually 2, 3, or 5 hp., depending upon the size of the mixer.

#### BATTERY CLEANING

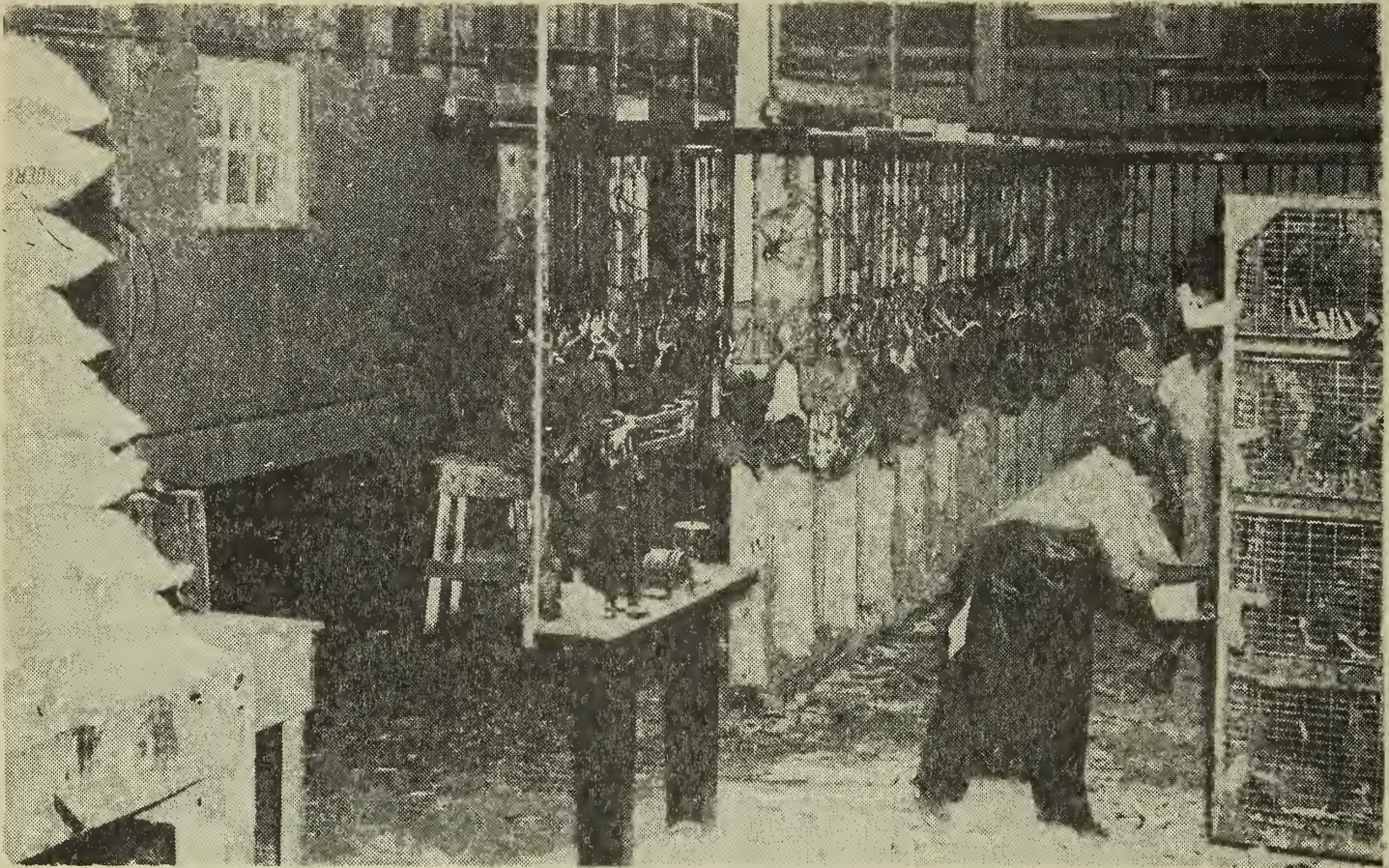
Battery pans are scraped by hand after the chickens are killed and when needed while the chickens are in batteries. Several plants have constructed an elevated hopper bottom bin outside the building which will hold one or more truckloads of the manure. These bins are filled by a homemade drag type conveyor fed from inside the building.

At some plants the entire battery is washed with water from a high pressure line when emptied of chickens at the killing line. The frequency of disinfecting with chemicals or steaming depends in part upon facilities available and the prevalence of parasites and disease. Steaming equipment is reported by several plants to avoid sores on workers' hands associated with poultry dressing.

#### KILLING OR DRESSING LINE

A power-driven endless chain with shackles attached moves the birds through the several processes and machines employed in dressing. A No. 62 malleable or steel chain of the type commonly used for transmitting power on farm machinery is frequently seen. Special links in the chain provide means of attaching a shackle chain to which is attached a shackle. Individual shackles on the chain are hung from beneath a trolley or the shackles are grouped in units of two's or three's under a trolley with a wider space between the groups than between individual shackles.

The trolley rail usually hangs from the ceiling at a distance of about 7 feet from the floor, and provides sufficient shackle chain so that the bottom of the shackle hangs from 52 to 57 inches from the floor. The actual distance between the bottom of a shackle and the floor at a particular point depends upon the slope of the floor to drains and



*Figure 3. - Live birds shackled and ready to start the trip through the killing or dressing line.*

irregularities in the floor and track. Some managers prefer to have shackles hang lower than 57 inches. Two plants where shackle heights were measured had the shackles set at about 52 inches and another 53 inches from the floor. Others where measurements were made were higher than 53 inches but none were over 57 inches. A shackle should be at a convenient height for pinners to work on the birds.

The farm machinery type chain is driven by a sprocket mounted on a vertical shaft. Power is supplied by a fractional hp. motor, through gear reduction equipped with a variable speed control unit. By turning a crank the line can be slowed down or speeded up without stopping.

A track and chain assembly said to have been developed for moving machine parts continuously through heat treating processes or through spray painting chambers is used successfully for poultry dressing. This endless chain, with links of special design, moves through a square tube which has a slot in the center of the lower face. Rollers are attached to the chain links which support them both vertically and horizontally. This peculiar design permits the track to diverge from a straight line either up, down, sideways or, on a reverse turn, on a curve having a radius of only two feet. The path in which the steel or malleable chain travels can diverge from a straight line, sideways, or make a reverse turn on a radius less than two feet but up or down only on a radius of perhaps 14 feet or more. Even this slow turn is not good for a chain designed to work in one plane.



*Figure 4. - The first operation on the dressing line is cutting the chicken's throat.  
(P.M.A. Photo)*

This new type chain has a device known as a clevis load pendant attached to the chain links. The pendant hangs from the chain through the slot in the box tube which, of course, extends the full length of each tube section making up the track assembly. The pendants are usually spaced either 6 inches or 12 inches apart. The exact spacing with regular load pendants depends upon the pitch length of the links. Special attachments are provided if the spacing desired differs from standard.

The new type chain has a special drive which resembles a track laying tractor track with lugs which engage a number of links at a time. Power is supplied by a fractional hp. motor through gear reduction and a speed control unit. The speed of the chain can be changed at will by turning a crank while it is in motion. Speed control units of the type used usually permit a maximum of 100 percent change in speed. In other words, if the minimum speed of the chain is 12 feet a minute, the maximum would be 24 feet a minute. To change this range to 6 to 12 or 24 to 48 feet a minute, some change would need to be made in gears, sprockets, or pulleys used in the power transmission assembly.

#### BLEEDING TROUGHS

Bleeding troughs were found in most plants. These troughs not only catch blood but pipe it to a drain. Water is usually admitted at several points to wash the blood to the drain as it accumulates. The troughs

are sheet metal, usually home made, and vary widely as to length depending in part upon the speed of the line. They are frequently about as long as the scalding tank.

#### SCALDING TANKS

Scalding tanks are oblong structures made of sheet metal, 36 to 40 inches wide, 40 to 48 inches high, and 8 to 24 feet long, inside dimensions, and are divided lengthwise into three vertical sections. The chickens move through the center section while shackled and are submerged except for the feet. One or more propellers withdraw the water from the center section causing it to flow over the top of the baffle walls into the center section and down over the chickens.

The water temperature is regulated automatically by admitting live steam as needed, and electric motors are used for operating the propellers. On an 8-foot tank two 3 hp. motors are common. A 24-foot tank may have as many as four  $7\frac{1}{2}$  hp. motors for the propellers.

The scalding tanks are emptied and washed daily. Fresh water is admitted either automatically or by hand to keep the tank full while in use. The feathers absorbing water and some adhering to the birds constantly removes water from the tank. While accurate water level and temperature control devices are available, those observed were often operating poorly. One plant had a man stationed at the scalding tank to regulate the temperature in the event the automatic device failed and when the need for a change occurred due to the kind of chickens being dressed. Other managers check the water temperature frequently with a mercury thermometer for fear of fluctuation in temperature great enough to affect dressing operations. Most plants operate with the highest possible scalding water temperature which will not affect the appearance of the birds. The exact temperature used is reported to depend upon the breed of bird, its condition and age, the speed of the chain, and the length of the scalding tank.

Perhaps one reason for high scalding water temperatures at some plants is because almost twice as many chickens are dressed per hour as the plant was designed to handle. After operations got underway, it was found that by adding a few more pinners the line could be run faster and therefore more birds could be dressed in an hour. In some cases, this continued until there was no more room for pinners to work. The duration of scalding varied from approximately 30 seconds to over one minute at different plants.

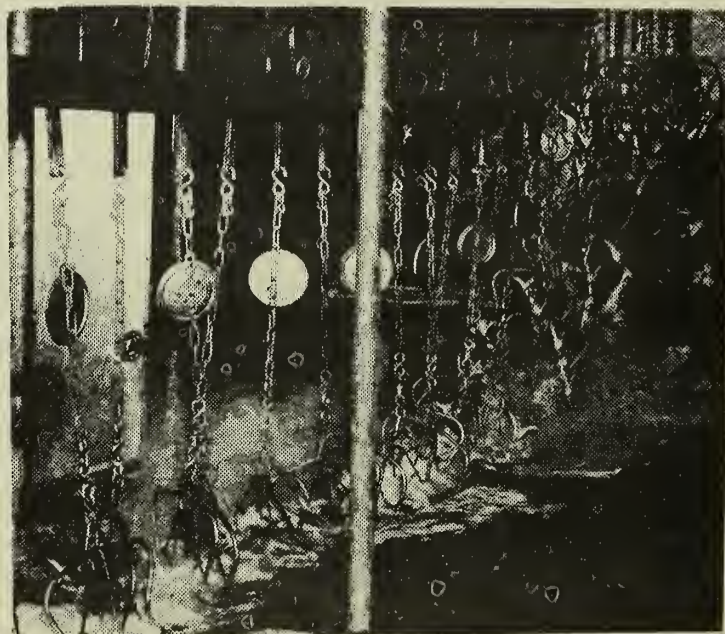


Figure 5. - The chickens move through a scalding tank. (P.M.A. Photo)



Figure 6. - Automatic picking machines remove most of the feathers. (P.M.A. Photo)

#### AUTOMATIC PICKERS

Machines for removing body feathers from chickens without hand manipulations have two cylinders or rotors approximately parallel, mounted horizontally or at an angle, and from which radiate hundreds of rubber tubes or strips known as fingers. The machines are set beneath and parallel to the line. Fingers on opposite cylinders clear as the cylinders turn inward, tending to pull the bird downward.

These cylinders, while adjustable vertically and horizontally, operate at a fixed position on most machines. At least one manufacturer has a machine with cylinders mounted in a frame with the frame moving up and down as the drums revolve. Cylinders set at an angle have somewhat the same effect in that the fingers strike the bird at different points as it moves between the rotors.



Figure 7. - Some feathers escape the picking machines and are removed by hand, an operation known as pinning. (P.M.A. Photo)

Automatic pickers with cylinders 4 or 6 feet long are common. Each cylinder is driven by a separate motor. A 4-foot picker often has two 1 hp. motors, and a 6-foot machine, two  $1\frac{1}{2}$  hp. motors for operating cylinders. Some plant managers like to have one "up and down" picker in the line especially where turkeys are dressed as the stroke is sufficient for the picker fingers to cover the bird from one end to the other. Most plants have at least two automatic pickers and some of the larger ones have more.

#### BUFFERS

Buffers are mechanical pickers for hand manipulation of the bird. When used in production line operations they are helpful in removing feathers left by the automatic pickers. The machine has one drum set in a horizontal position studded with rubber fingers. The operator pulls the shackled bird over and presses it against the revolving drum in such a manner that the fingers strike the bird where feathers have been left by other machines.

A new machine similar to a buffer with two cylinders turning inwardly and designed for hand manipulation is working rather well at some plants in removing neck and back feathers.

For on-the-line operation, buffers have drums 2, 3, or 4 feet long. Two operators may be employed for each of the larger sizes which are equipped with a 1,  $1\frac{1}{2}$ , or 2 hp. motor. The smaller size buffers are usually equipped with a motor of less than 1 hp.



Figure 8. - Venting, cropping, inspecting, and singeing chickens completes the dressing operations. (P.M.A. Photo)

### SINGERS

Singers are often homemade and are of a variety of shapes and sizes. They are mostly U-shaped with gas jets directed inwardly to singe the bird as it passes. Some operators place a bar across the path of the bird, ahead of the singer, causing the bird to swing backward and forward as it passes through the flame.

### SPRAY WASHERS

Some of these devices are rather elaborate with water jets directed against the birds at various angles; others are comparatively simple. The water spray is effective in washing the bird and probably does some chilling.

### CHILLING VATS

Concrete vats, approximately 4x4x4 feet, inside dimensions, serve well for chilling poultry at a number of plants. At some locations a wire basket perhaps 44x44 inches square, 30 inches high, and open at the top, is provided for each vat. When baskets are employed, a power hoist mounted on an overhead rail is used for lifting the loaded baskets and for moving them into the packing room. Ribs cast on the bottom of the tank or brick support the wire basket and provide a space for water underneath. Compressed air is released below the basket and used for agitating the ice water. It is piped from an air compressor of the filling station type or from a blower capable of developing several pounds air pressure per square inch.

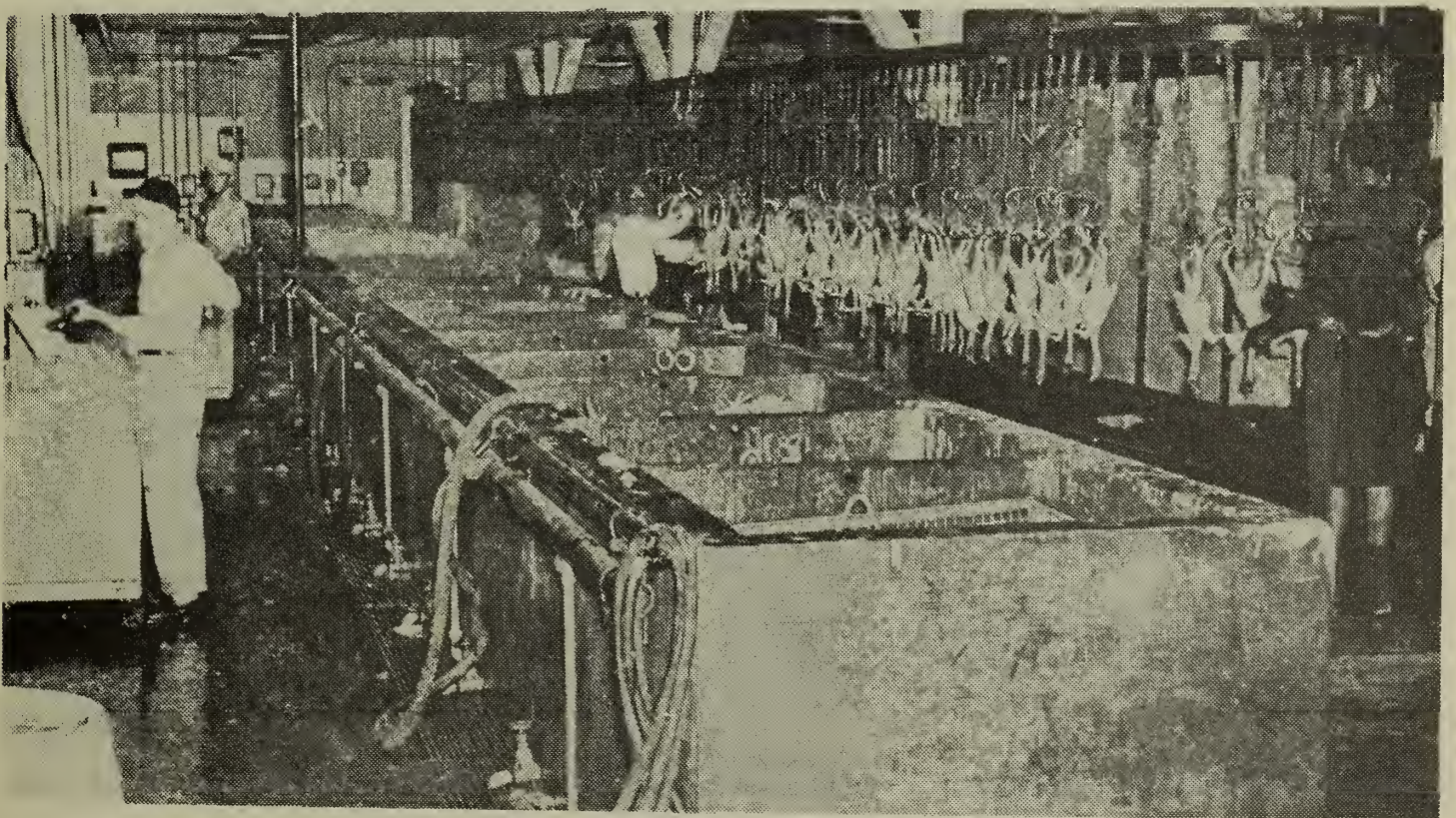


Figure 9. - Birds go from the dressing line to vats where they are chilled with ice.

Tanks made of heavy sheet metal are sometimes used in place of concrete, with or without permanent compressed-air fittings. Portable barrels (hogsheads) are lifted by means of hydraulic automobile-type jacks. These move to an air hose connection after being filled at the take-off from the dressing line. In such cases, one end of a piece of perforated pipe, coiled in the bottom of the barrel, extends up the side of the barrel with fittings for connecting the air hose. Barrels used in fixed positions may have a more permanent air supply system.

The several types of vats have their advantages and disadvantages. The porous nature of some concrete jobs presents cleaning problems. If changes are made in the floor plan, new tanks may need to be poured. Rust is a problem with metal tanks and barrels do not always stand up. Moving the heavy barrels on a jack is reported hard on concrete floors.

#### PACKING EQUIPMENT

Packing room equipment consists of tables, racks, boxes, roller track, and scales. The birds for sizing and grading may be placed on a table or in special containers. Sizing and grading may be done by the same person or each by a different person depending somewhat upon the size of

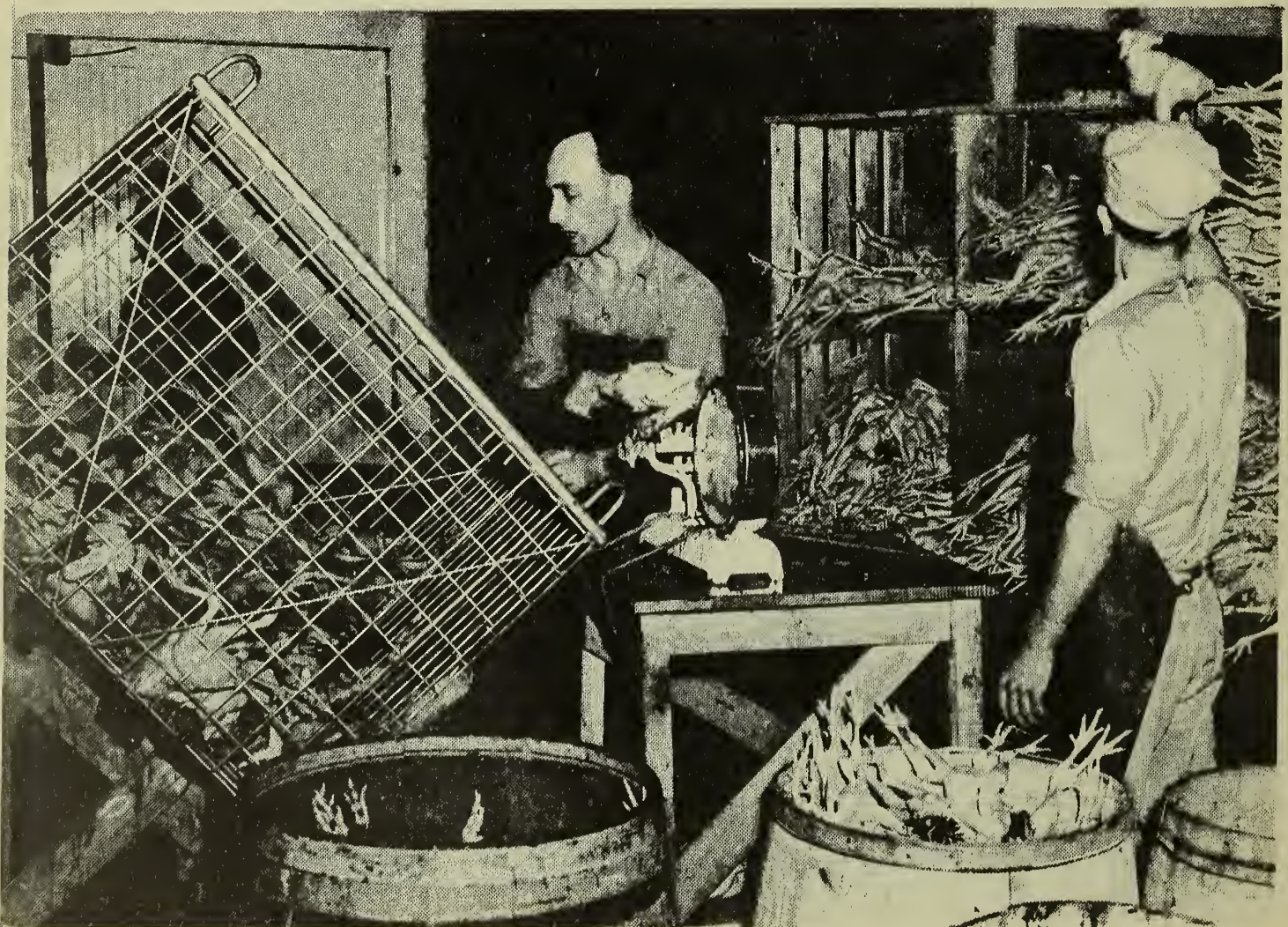


Figure 10. - The dressed birds are weighed, graded, and packed before leaving the plant.

the plant and the system followed. The sized birds may be placed on tables from which they are weighed and packed or they may be placed in post-office type racks, open at both sides, from which they are weighed and packed. Where weighers and packers are used for the several weight classifications and the birds are not equally divided as to size, some workers have more to do than others. In weighing and packing from post-office racks, birds are packed as the several compartments fill up, and all hands are kept busy.

Time studies show that the job of keeping packers supplied with chickens, boxes, and ice is very important for efficient operations. A circular trolley track with packing-house type scales has been suggested for use in poultry packing rooms to facilitate efficient packing. Each tray of sized and graded birds would be weighed at one point and move on to a packer.

Difficulties experienced in getting boxes and barrels for packing poultry during the war led to the use of a variety of kinds and sizes of containers. Regular wire-bound boxes, orange crates, and barrels were common. While there are several sizes of wire-bound boxes, those observed measured approximately 10 inches high,  $16\frac{1}{2}$  inches wide, and 24 inches long, outside dimensions. From 15 to 28 springs ranging from 2 to 4 pounds each are usually packed in a crate. The crate is lined with paper and the dressed birds when ice packed are usually not individually wrapped except for storage.

#### ICE CRUSHERS

Ice crushers in the majority of plants studied are machines capable of crushing perhaps 10 to 14 tons of ice to egg-size lumps in a day. Blocks of ice are broken down to 25 to 50 pound lumps and fed into the crusher by hand. Such machines are usually equipped with a 3 or 5 hp. motor.

#### BOILERS

Many of the boilers found in poultry dressing plants are second-hand and several were in poor condition. In some instances the management was not sure of the size of the boiler. However, according to the information obtained, boilers ranged in size from 8 to 125 hp. Due probably to the poor mechanical condition of some boilers and expansion of operations after the boilers were installed, the firemen questioned often replied that boilers were too small.

One plant dressing about 1,200 birds per hour has a 25 hp. oil-fired boiler and reported satisfactory service. Another plant of comparable capacity has a coal-fired boiler in good condition of about the same rating and reports satisfactory heating.

The exact size of a boiler for a dressing plant will of course depend upon the use made of the steam, on the climate, and on the type and size of the building to be heated.

#### WATER SUPPLY

A poultry dressing plant uses large quantities of water. A well for one plant, which dresses at least 1,200 birds per hour, is reported to have supplied 3,000 gallons per hour under test. Records obtained of water supplied by a city to a second plant observed dressing 1,400 birds per hour used an average of 546,917 gallons per month over a period of 12 months. On this basis, and for a 6-day week of 8 hours, 2,626 gallons were used per hour, or nearly 2 gallons per dressed bird. Both of these plants used vats for chilling. A third plant dressing about 800 birds per hour used an average of 372,000 gallons per month over a period of 3 months. On a 6-day week of 8 hours the plant used 1,789 gallons per hour or slightly over 2 gallons per bird.

#### WAX

Wax is sometimes used in dressing poultry to help remove feathers which have escaped the picking machines and to enhance the appearance of the dressed birds. Heated wax is applied by dipping and then hardened by chilling. The wax adheres to the feathers and many of them come off when it is removed either by hand or with a machine. It is also claimed that the fresh appearance or "bloom" of the bird is maintained by the treatment.

The waxers observed were all of the automatic double-dipper type with a reclaiming tank, a wax extractor centrifuge, and a heating or conditioning tank. Some plants use a conveyor, over which the wax pullers work, for conveying the used wax to the reclaiming tank and others provide baskets under a trough. The recovery and conditioning tanks may or may not be located in the dressing room. A separate room for these tanks is advisable during hot weather as they radiate heat.

The number of plants observed with wax was not sufficient for definite comparison on a production basis with those not equipped with wax. So far as the data show, plants with wax are turning out no more birds per worker than those without it. There is, however, some difference in the appearance of the bird in favor of wax.

One plant using wax shut off the special equipment and placed the wax puller on the pinning line for a demonstration. The contention was that the pinners would fall behind and the birds would not look as well as with the wax equipment in operation. The test did not last long enough for definite conclusion as to whether the pinners fell behind but the waxed birds did have a better appearance than those dressed without it.

While the market makes no distinction between waxed and unwaxed birds, certain buyers are reported to accept chickens for freezing only when they have been waxed.

The use of wax is controversial. Some employees and some officials in the same plant may have entirely different ideas about it. Even in a plant where wax is used, one person may state that the plant should discontinue its use and another will report that wax helps greatly in reducing labor and in obtaining high quality birds. In view of such statements, one might conclude that to wax or not to wax depends upon the management. If the management is sold on wax, if space is available in the dressing room to install it, and if the equipment is available, it should be installed. Under such conditions, the equipment will probably be operated as it should be and good results obtained. While waxing equipment is not particularly complicated, it requires the full time of at least one man as well as some supervision.

#### BYPRODUCTS

Droppings and offal are disposed of at the expense of the processing, or at no profit, at all the plants studied. Blood is not recovered. Three plants receive some returns from feathers. At one plant body feathers collected from beneath the automatic pickers are recovered, dried, and bagged. Regular commercial feather driers are used.

These driers resemble somewhat a feed mixer as the feathers are stirred and agitated by blades and arms attached to a shaft. As the feathers dry, they become lighter and are finally sucked out and blown into a bag which collects the feathers and allows the air to escape like a dust collector on a vacuum cleaner. Steam in coils enclosed in a curved jacket at the bottom furnishes heat for drying.

Two plants make use of special feathers in addition to body feathers. At these plants the birds are placed in batteries according to color. The quill feathers are removed prior to or immediately after killing and before scalding. These feathers are kept separate, by color, and sold without processing. Feathers around the base of the neck and over the root of the tail of roosters are removed dry and kept separate as to kind and color. These special feathers bring a high price and one plant reported good returns from its feather business.

In plants where feathers are not recovered, they are gathered and dumped with droppings or placed in barrels, hauled out, and dumped on waste land. At some locations, offal is given without cost to anyone hauling away the feathers. Offal is used as hog feed. One plant with eviscerating facilities contemplates the installation of rendering equipment. In areas where a large percentage of the chickens processed are fat matured birds, rendering may pay. Some operators are of the opinion that it would not be worthwhile where only springs are eviscerated.

#### TIME STUDIES

The time available for the survey of poultry dressing plants, the nature of the study, and the availability of instruments were not conducive to time and motion studies. Data were obtained on personnel, operations,

and crews which give a good idea of the work done and the performance of crews under the conditions in the several plants. Such information for dressing and packing is presented in tables 1 to 3, inclusive.

The duties of employees at the several plants classified as supervisory, maintenance and clerical, receiving, and holding and feeding, varied too much for comparison as to the number of employees or performance of crews.

Information was also obtained on the time consumed in performing some specific operations. As might be expected, the performance of individuals and crews depends largely upon the convenient arrangement of materials and equipment, the speed at which the workers move, and the skill or technique previously acquired.

Table 1. - Dressing chickens: Operations, number of workers, number of chickens dressed, and performance per worker at 11 plants.

OPERATIONS	PLANT										
	11	12	14	16	17 <sup>a</sup>	18 <sup>a</sup>	19	20	22	23	24
Foreman.....	1	-	1	1	1	1	-	1	1	1	1
Hanging.....	4	3	9	3	1	2	3	5	1	5	1
Killing.....	2	2	2	2	1	2	1	2	1	2	1
Pulling feathers.....	-	-	-	-	1	2	-	-	-	-	-
Raking feathers.....	1	1	2	1	-	-	1	1	-	2	-
Roughing.....	4	4	3	4	2	1	-	1	-	-	2
Buffing.....	2	3	8	2	-	-	5	-	3	3	1
Cleaning wings.....	3	-	8	-	1	-	8	-	-	4	-
Hanging heads.....	-	-	-	-	2	1	2	4	-	5	-
Hanging feet.....	-	-	-	-	-	-	2	3	-	5	-
Pinning garters.....	-	-	-	-	-	-	4	-	-	-	-
Pinning body.....	-	-	-	-	-	-	7	-	-	-	-
Pinning neck.....	-	-	-	-	-	1	2	-	-	-	-
Stripping wax.....	-	-	-	-	3	5	-	14	-	-	-
Pinning..... <sup>b</sup>	25	24	41	27	11	16	-	30	16	36	9
Finishing.....	4	3	2	2	-	-	5	-	-	-	-
Inspection.....	-	-	2	1	-	-	1	2	-	3	-
Checking pinners.....	2	2	3	2	2	-	-	3	1	-	-
Cropping.....	2	2	3	2	1	2	1	2	-	2	-
Venting.....	2	1	2	1	-	-	1	1	-	-	-
Singeing.....	-	-	-	-	-	-	1	-	1	-	-
Washing.....	-	-	2	-	-	-	-	-	-	-	-
Cleaning feet.....	-	-	2	-	-	-	-	-	-	-	-
Wrapping heads.....	-	-	-	-	1	2	-	-	-	-	-
Taking off.....	2	2	4	2	1	2	1	2	1	4	1
Centrifuging feathers..	-	-	-	-	1	1	-	-	-	-	-
Drying feathers.....	-	-	-	-	1	1	-	-	-	-	-
Tending wax.....	-	-	-	-	(b)	(b)	-	1	-	-	-
Total workers.....	54	47	94	50	30	39	45	72	25	72	16
Birds per hour.....	1,375	1,160	2,705	1,400	550	850	875	1,700	400	1,950	350
Birds per hour per worker.....	25.5	24.7	28.8	28.0	18.3	21.8	19.4	23.6	16.0	27.1	21.9

<sup>a</sup>Fowl.

<sup>b</sup>Foreman tends wax for part-time operations.

Table 2. - Chilling and packing dressed chickens: Operations, number of workers, number of chickens handled, and performance per worker at 11 plants.

OPERATIONS	PLANT										
	11	12	14	16	17	18	19	20	22	23	24
Foreman.....	1	-	2	-	(a)	(b)	-	1	(c)	1	(d)
Crushing ice.....	1	1	2	1	(a)	(b)	1	1	(c)	1	(d)
Filling vats.....	-	-	-	-	(a)	(b)	1	-	(c)	-	(d)
Icing vats.....	1	-	2	-	(a)	(b)	-	2	(c)	1	(d)
Arranging birds in vats.....	-	-	1	-	(a)	(b)	-	-	(c)	-	(d)
Hoisting baskets.....	2	-	2	-	(a)	(b)	-	1	(c)	-	(d)
Emptying baskets or vats.....	-	1	2	2	(a)	(b)	2	-	(c)	2	(d)
Sizing and grading.....	2	2	2	2	(a)	(b)	2	2	(c)	2	(d)
Weighing.....	1	2	5	2	(a)	(b)	1	6	(c)	-	(d)
Packing.....	4	3	5	2	(a)	(b)	2	-	(c)	5	(d)
Icing boxes or barrels.....	1	1	3	-	(a)	(b)	1	-	(c)	1	(d)
Closing boxes.....	2	1	1	-	(a)	(b)	-	-	(c)	3	(d)
Loading boxes.....	-	-	2	-	(a)	(b)	-	-	(c)	-	(d)
Box make-up and supply.....	2	2	5	-	(a)	(b)	-	1	(c)	4	(d)
Recording.....	-	-	1	-	(a)	(b)	-	-	(c)	-	-
Heading barrels.....	-	-	1	2	(a)	(b)	-	-	(c)	-	(d)
Stenciling.....	-	-	-	1	(a)	(b)	1	1	(c)	-	(d)
Stacking boxes.....	1	1	-	-	(a)	(b)	-	-	(c)	-	(d)
Pushing carts, etc.....	-	-	-	1	(a)	(b)	-	1	(c)	-	(d)
Shipping.....	-	-	-	-	(a)	(b)	-	1	(c)	-	(d)
Total workers.....	18	14	36	13	-	-	11	17	3	20	3
Birds per hour.....	1,375	1,160	2,705	1,400	550	850	875	1,700	400	1,950	350
Birds per hour per worker.....	76.4	82.9	75.1	107.7	-	-	79.5	100.0	133.3	97.5	116.7

<sup>a</sup>Take-off man hangs birds on racks and pushes to scales.

<sup>b</sup>Take-off man hangs birds on rack. Head wrappers weigh birds and push rack to cooler.

<sup>c</sup>Icing vats and packing.

<sup>d</sup>All jobs of icing and packing.

Table 3. - Performance of workers dressing and chilling and packing dressed springs at 11 plants.

PLANT	OBSERVED PLANT CAPAC- ITY - NUMBER OF BIRDS PER HOUR	DRESSING		CHILLING AND PACKING	
		NUMBER OF PERSONS IN CREW	BIRDS PER WORKER PER HOUR	NUMBER OF PERSONS IN CREW	BIRDS PER WORKER PER HOUR
11.....	1,375	54	25.5	18	76.4
12.....	1,160	47	24.7	14	82.9
14.....	2,705	94	28.8	36	75.1
16.....	1,400	50	28.0	13	107.7
17.....	<sup>a</sup> 550	30	18.3	-	-
18.....	<sup>a</sup> 850	39	21.8	-	-
19.....	875	45	19.4	11	79.5
20.....	1,700	72	23.6	17	100.0
22.....	400	25	16.0	3	<sup>b</sup> 133.3
23.....	1,950	72	27.1	20	97.5
24.....	350	16	21.9	3	<sup>b</sup> 116.7
Average	1,210.5	49.5	23.2	15	96.6

<sup>a</sup>Fowl. Slack season, part-time operations at below plant capacity.

<sup>b</sup>Not entirely comparable with other plants.

Plants devoted exclusively to poultry and those processing 1,000 to 1,500 New York dress birds per hour have seven to nine employees who might be classified as supervisory, maintenance, and clerical. Such plants have a manager and an assistant manager or plant superintendent. In many cases the assistant manager is in general charge of all operations about the plant. An office manager, or the manager and two or three clerical workers, usually makes up the office force. Most plants studied have a poultry buyer, although the manager sometimes does the poultry buying.

The majority of the plants studied have a night watchman and some have two. In the latter case, these men do some clean-up work during the night, fire the boiler, and have the plant ready to run when the regular crew comes on in the morning. A few plants have a janitor and several have a mechanic or maintenance man who is somewhat of a jack-of-all-trades. Some of the large plants have a sizeable crew for clean-up and maintenance work. However, it is customary to have the foreman of each of the departments responsible for keeping his department in running order. Certain regular employees usually work overtime on such jobs as sweeping, scrubbing, and steam sterilizing.

Foreman of the receiving, holding and feeding, dressing, and packing departments are grouped with the respective crews in this report. In large plants they should probably be classified as supervision personnel. However, those in smaller plants sometimes work at certain jobs and function in a supervisory capacity only occasionally.

#### RECEIVING

Only 3 of the 13 plants studied have their own crews for receiving poultry at the plant. In these instances, the chickens are brought in by custom haulers. At most other locations plant-owned trucks and plant crews are used exclusively or in conjunction with custom hauling or delivery by the farmers. Several small plants rely upon farm deliveries and employees having other duties help unload. One plant observed dressing 1,160 birds per hour had a crew of 7; a second dressing 1,375 per hour had a crew of 9; and a third dressing 2,705 per hour had 19 for unloading and transferring the birds from coops to batteries, weighing, and pushing the batteries into the feeding room. These crews have few if any other duties.

The exact number of workers required to catch the chickens on the farm, place them in coops, weigh, load, and haul them to a plant, depends in part upon the number of chickens per farm and on the distance hauled. One plant dressing 1,400 birds per hour reported a crew of 14 with 4 trucks. This crew not only brought the birds to the plant, but also placed them in batteries. A second plant with perhaps shorter hauls reported a crew of 15 with 5 trucks which supplied chickens for dressing at the rate of about 1,700 birds per hour.

The best performance observed in unloading springs at a plant was with a crew of 9 to 12 workers divided as follows: 2 unloading coops; 4 to

6 transferring birds from coops to batteries; 1 stacking coops; 1 weighing, and 1 to 2 pushing batteries. This crew, with 11 workers, was observed operating at a rate of 5,280 birds per hour or 480 birds per worker per hour in unloading a part of a truck load of chickens. All observations made at the plant indicated an average of 4,278 birds per hour or 389 per worker per hour, with an average crew of 11.

The high performance was due in part to one or more of the following conditions: batteries and coops conveniently arranged, a minimum of waiting for coops and batteries, disagreeable weather with the workers knowing they could rest in a warm room when the truck was unloaded, workers knowing they were being timed, the job assignment was such as to keep each member of the crew busy, and girls did the work of transferring the birds from coops to batteries. Girls or women are usually faster than men working with small objects manipulated by hand. This crew of 9 to 12 workers with the equipment used would probably unload at the rate of 3,500 to 4,000 birds per hour under normal conditions. The management reported that from 30 minutes to 1 hour was usually required to unload a truck of 2,500 to 3,000 birds.

A roller conveyor is used for unloading at this plant. It extends from the truck for a distance of about 24 feet on a dock 20 feet wide and is elevated approximately 2 feet from the floor. One battery for each catcher is placed beside the conveyor on one side and the empty coops stacked on the opposite side. Coops are placed on the conveyor, one coop deep, and rolled to the catchers who stand between the coop and battery. The unloaders keep the conveyor full of coops at all times. A stop is provided at the end of the conveyor so that the coops can not fall off the end. As each coop is emptied, it is pushed from the conveyor sideways or the coop stacker grabs it when the last chicken is removed. When a coop is removed from the line, the unloaders filled the gap by pushing all coops in line from the loading end. With this procedure, the catcher always has a coop of chickens from which to work but not always the one he starts to empty. The feeding batteries are turned by the pushers or by the catchers. With larger crews a battery turner is employed.

A second plant using an eight-man crew was observed unloading at the rate of 2,750 chickens per hour or 344 birds per worker. In both of these cases, the birds were unloaded at a rate over twice as fast as the plant was dressing them. According to these observation, the labor cost of unloading the chickens was at least twice as much as it might have been as the unloading crew did little, if any, work in addition to unloading.

At one plant the unloading crew lines up sufficient batteries with adjacent roller track for the load expected. When a load arrives, coops are stacked three or four high on the roller conveyor and pushed alongside the batteries, on both sides. The work of getting the batteries ready, weighing the chickens, and in pushing the batteries to the feed room is done between loads. While this method of unloading is probably not as fast as some other, a smaller crew is required.

To reduce labor cost trucks with a false bed or a trailer-type truck have been suggested for hauling chickens. With a false bed, the entire load could be pulled from the truck with a winch, an empty loaded, and the truck return to the farm for another load with only a few minutes at the plant. With a trailer, the truck could likewise return with an empty and spend only a short time at the plant. In either case, a much smaller crew could be maintained at the plant for unloading with a corresponding reduction in labor cost.

One plant where the field crew places the birds in batteries, a rate of 2,136 birds per hour was observed with a crew of 6 men, or 356 birds per worker. However, these workers do nothing but unload the chickens and place them in batteries. Employees having other duties in the plant line up sufficient batteries for the load expected and weigh the birds as the batteries are filled.

One plant where the birds are inspected on delivery and the farmer helps unload, two men were observed working at the rate of 338 birds per worker per hour. This rate also includes the time for weighing, bringing out empty batteries and pushing the full one into the feeding room. No special equipment is used.

#### HOLDING AND FEEDING

The practices followed in holding and feeding vary widely. For this reason no definite comparison can be made between plants studied as to performance of crews. The number of employees ranged from 6 to 27 in 5 plants which dressed from 875 to 2,705 birds per hour. Some crews have individuals assigned to specific jobs such as weighing, mixing feed, feeding, pushing batteries, and cleaning batteries. Plants usually report one feeder for each 40 to 50 batteries.

#### DRESSING

Dressing operations are sufficiently similar that some comparison can be made between the several plants as shown in tables 1 and 3. However, this information should be of interest primarily as to crews and their duties. No yardstick as to the condition of the birds when killed or the quality of the finished product is available.

Some of the small plants, or those operating at below rated capacity, show up to disadvantage in the number of birds dressed per hour per worker when compared with the large plants. Certain employees such as the foreman, hangers, killers, inspectors, croppers, venters, and those removing the birds from the line are needed regardless of the capacity of the plant. For this reason, some individuals do not work at capacity in a small plant. The average number of birds dressed, mostly springs, is 23.2 per hour per worker for all plants.

Research work is needed in developing new methods and principles for removing feathers from poultry. The machines used at present remove a large percentage of the feathers but those remaining are really the time consuming ones to remove.

## CHILLING AND PACKING

The number of birds chilled and packed (wet pack) per worker per hour for a crew ranges from 76.4 to 133.3 in the several plants as shown in table 3. The two high plants, 116.7 and 133.3 birds per worker per hour, should perhaps be omitted as the duties of the workers are not entirely comparable with those at other plants, or they work longer hours than the dressing crew.

High performance of packing crews generally reflects convenient arrangement of equipment and supplies and type of equipment used. Plants which have a packing line arranged so that all employees work at or near capacity show the best performance. Racks of the pigeon hole or post office type for grading in large plants seem to work out rather well as there is a minimum of waiting for birds. The packers work from the racks as they fill up and do not have to wait for birds which fall within a particular weight or grade classification.

At one plant where packers were timed, two of four girls packed wire-bound boxes at the rate of 24 birds per minute or 12 birds per minute per worker. This includes the time required to receive the box, pack it, and push it on the line to be iced and bound. At this rate, the two girls packed birds faster than they were being dressed, yet four packers were employed. Only two girls were actually working because birds brought from the chilling vats at the time happened to fall generally within two weight classifications. While the girls were aware that they were being observed, observations at other times indicated they worked at a normal speed which doubtless could have been maintained through the day. Approximately 44 percent of their time in packing was consumed in waiting for a box and in getting the filled box on the line.

At a second plant, girls were observed packing at the rate of 18.9 birds per minute per worker. At a third plant, one girl was timed at 21.8 birds per minute which was approximately one wire-bound box per minute. However, her output during the time observations were made was reduced almost 50 percent in waiting for boxes or for the box to be iced. Instead of an output of 21.8 birds she was actually packing at the rate of about 10.9 birds because of the time lost in waiting for supplies. A plant could not hold the number of employees for a particular job to a bare minimum because of daily fluctuations in the number of birds dressed and because of absenteeism. However, by providing convenient working conditions and by synchronizing operations in packing, the number of employees could be reduced and the work lightened for the individual at some plants.

A further reduction in labor might be made if both dressing and chilling could be synchronized for on-the-line operations. Dragging birds shackled to a chain through long vats filled with ice water or brine has been suggested. While chilling in liquids is much faster than in air, the time element in a liquid appears too great for practical application for production line operations. Research work might, however, develop means for on-the-line chilling.

## DRAWING

The performance of crews in drawing as a part of the dressing operation is shown in tables 4, 5, and 6. Drawing on the line was a regular procedure at plant 15. At the other two plants, the crews are more accustomed to the regular dressing operation than to drawing. It would appear, however, that an experienced crew might be expected to dress and draw on the line, 65 to 70 percent as many birds per hour as they could dress. In other words, a plant turning out 1,000 New York dressed springs should dress and draw 650 to 700 springs per hour with the same crew.

## EVisCERATING

The number of birds eviscerated per hour is limited by inspection service. A veterinarian is permitted to examine only so many birds. For fowl, the maximum allowed is approximately 720 per hour. For springs, the number is somewhat higher as there are fewer diseased birds in young stock for short periods. Even under these conditions a production of 840 birds per hour is usually a maximum. One plant however, was observed eviscerating at the rate of 924 springs per hour. A crew of about 40 employees is usually associated with one inspector. The size of crews observed in eviscerating is shown in tables 8 and 9, and in packing cut-up eviscerated birds in table 10.

Table 4. - On-the-line drawing of springs: Operations, equipment used, number of workers, and performance per worker at plant 15.

OPERATIONS	EQUIPMENT	WORKERS
Hanging.....	From coops	2
Killing.....	Knife	1
Scalding.....	12-foot scalders	-
Picking.....	4-foot automatic	-
Buffing.....	3-36-inch buffers	3
Removing feathers and waste.....	Rake, fork, and wheel barrow	1
Pinning.....	Knife or fingers	8
Splitting neck and removing craw.....	Knife	1
Removing head.....	Knife or shears	1
Removing vent (open).....	Knife	1
Finishing (pinning).....	Knife or fingers	3
Drawing.....	Over table	2
Taking off and removing feet.....	Power saw	1
Cleaning giblets.....	Pan, water, knife, shears	5
Wrapping giblets.....	Table, paper	2
Placing giblets in body cavity.....	Direct from portable chilling vat	2
Packing.....	Barrel, box, etc.	2
Icing, helping pack.....	Shovel, ice delivered crushed	1
Total workers.....		36
Birds per hour.....		600
Birds per hour per worker.....		16.7

Table 5. - On-the-line drawing of springs: Operations, equipment used, number of workers, and performance per worker at plant 16.

OPERATIONS	EQUIPMENT	WORKERS
Hanging.....	From battery	2
Killing.....	Knife and pick (brain puncture)	2
Scalding.....	16-foot scalders	-
Picking.....	4-foot up and down	-
Picking.....	4-foot stationary	-
Roughing.....	None	4
Picking.....	5-foot stationary	-
Buffing.....	1 - 48-inch	2
Pinning.....	Knife and fingers	14
Singeing.....	Gas jets	-
Finishing.....	None	2
Checking birds per pinner.....	Pad and numbers	2
Inspecting.....	None	1
Hanging heads.....	None	1
Opening.....	Knife	1
Drawing.....	Over table	2
Splitting neck.....	Knife	2
Pulling craw.....	None	2
Removing vent.....	Knife	1
Removing head.....	Knife or shears	1
Removing neck.....	Knife or shears	1
Removing feet and taking off.....	Shears	2
Separating giblets from intestines.....	Knife, shears, fingers	2
Cleaning giblets.....	Pans, water, table	9
Crushing ice.....	Ice crusher	1
Taking out of vats.....	Board and hands	2
Hanging by wings to drain.....	Rack	2
Hanging by legs and placing giblets in body cavity.....	Rack	2
Grading.....	Shelves	1
Weighing.....	Scales	1
Packing.....	Barrels	1
Stenciling and recording.....	Stencil brush, ink, etc.	1
Closing barrels and loading out.....	Hand truck, hammer, etc.	1
Mechanic.....	Tools	1
Removing feathers and waste.....	Rake, fork, and wheel barrow	1
Water temperature regulator.....	None	1
Total workers.....		68
Birds per hour.....		1,067
Birds per hour per worker.....		15.7

Table 6. - On-the-line drawing of springs: Operations, equipment used, number of workers, and performance per worker at plant 21.

OPERATIONS	EQUIPMENT	WORKERS
Hanging.....	From battery	3
Killing.....	Knife	1
Scalding.....	12-foot scalders	-
Picking.....	6-foot automatic	-
Pulling wing and tail feathers.....	None	1
Hanging heads.....	None	2
Picking.....	4-foot automatic	-
Hanging feet.....	None	2
Buffing.....	48-inch buffer	2
Pinning.....	Knife and fingers	21
Singeing.....	Gas jets	-
Opening.....	Knife	1
Drawling.....	Over table	2
Removing vent.....	Knife	1
Splitting neck.....	Knife	2
Removing crop.....	None	2
Removing head.....	Knife, shears	1
Checking birds per pinner.....	Pad and numbers	2
Inspecting.....	None	1
Removing head, feet, and take-off.....	Shears	2
Emptying vats.....	Board and hands	2
Racking.....	Rack	1
Cleaning and wrapping giblets.....	Table, pans, water, etc.	9
Placing giblets in body cavity.....	None	2
Unloading rack to packer.....	Rack	1
Weighing and sizing.....	Scales	1
Packing.....	Barrels or box	2
Stenciling.....	Pad, ink, etc.	1
Heading barrel.....	Hammer, nails, etc.	1
Crushing ice.....	Ice crusher	1
Icing tanks.....	Cart and shovel	1
Icing birds and helping with barrels.....	Shovel, hammer	1
Removing feathers and waste.....	Rake, shovel, cart	1
Total workers.....		70
Birds per hour.....		730
Birds per worker per hour.....		10.4

Table 7. - On-the-table drawing of springs for canning: Operations, equipment used, number of workers, and performance per worker at plant 19.

OPERATIONS	EQUIPMENT	WORKERS
Removing birds from thawing vats.....	None	2
Splitting neck.....	Knife	1
Racking.....	Rack	1
Removing head and feet.....	Block and cleaver	2
Removing oil sack.....	Knife	1
Splitting.....	Knife	1
Removing vents.....	Knife	2
Drawing.....	None	3
Separating giblets from intestines.....	Knife, fingers, shears	2
Removing windpipe, craw, and lungs.....	Eviscerating tools	7
Inspecting.....	Eviscerating tools	2
Washing.....	Spray nozzle	1
Cleaning liver and gizzard.....	Knife and fingers	2
Packing.....	Scales, boxes, etc.	3
Total workers.....		30
Birds per hour.....		<sup>a</sup> 674
Birds per hour per worker.....		22.5

<sup>a</sup>Rate at which birds were fed to table. Crews cleaning birds and giblets fell behind and all hands helped occasionally to catch up. Birds were cleaned more thoroughly than for regular drawing. Rate of 674 birds per hour is perhaps about right for regular drawing.

### DRESSING TURKEYS

It is not customary to hold and feed turkeys at the plant, at least at the plants where studies were made. The coops of turkeys from the farm are customarily taken directly to the killing line and stacked. The same crew and equipment is used as for dressing chickens. Plants accustomed to dressing turkeys are reported to dress one-fourth to one-sixth as many turkeys per hour as chickens with a comparable crew. While counts were made as to the number of turkeys dressed per hour at several plants, the size of the lot was too small in most instances for reliable data. However, judging from the information obtained, it appears that the estimate of one-fourth to one-sixth as many turkeys per hour as chickens is correct. The exact production relative to chickens depends upon the age and condition of the turkeys and the percentage of toms.

Much the same equipment is used for processing turkeys as chickens. However, if a plant contemplates dressing very many turkeys equipment designed for these heavier birds should be installed. Chilling turkeys in vats is practiced in some localities but the usual method is to chill them on racks in refrigerated rooms at a temperature of 34° to 36° F.

## BUILDING AND EQUIPMENT

### COST

The investment in buildings and facilities at the several plants studied would be of little value as a basis on which to estimate the cost of a new plant. Some of the plants grew up over a period of years, some producer groups made use of existing structures, with or without additions, and in one or two instances producer members assisted in the construction of the plant. There is also a wide difference in the equipment used. The number of feeding batteries and cold storage facilities influence greatly the cost of a plant. The cost of constructing a plant of any given capacity might vary 100 percent depending upon whether it was constructed prior to the war or about the time it ended. However, it is estimated that the plants where observations were made and those constructed during the period 1943 to 1945 represent investments ranging from approximately \$40,000 to \$500,000.

Batteries for feeding are one of the largest equipment cost items at a poultry dressing plant. A regular 16-compartment steel battery costs about \$55, depending somewhat upon the size of the order and how shipped. A plant dressing 1,000 to 1,500 birds per hour and feeding them 3 days needs about 300 batteries. On this basis batteries represent an investment of \$16,500.

The exact cost of other items of equipment depends somewhat upon the size, type, make, and extras. In estimating the total cost of equipment for a plant processing 1,000 to 1,500 birds per hour, the following items should be included: one scalding, \$2,000; two pickers, \$3,000; two buffers, \$1,000; scales for weighing batteries, \$600; ice crusher, \$300; and feed mixer, \$300. To this list also must be added the cost of the dressing line.

In calculating the cost of the line a figure of \$5 per foot is sometimes used for the new type chain assembly complete with power unit. On short lines the cost will exceed \$5 per foot and on long lines it will be less than \$5 per foot. The power unit, complete, is reported to cost about \$450. One plant reported a total cost of \$1,550 for all items for a track 235 feet long. On the basis of these estimates, the major items of equipment used in turning out 1,000 to 1,500 dressed birds per hour would cost at least \$25,000.

### PLANT DESIGN

In studying poultry dressing plants and operations, information was obtained as to floor plans for studying the movement of the product through the plant and for information on which to base new designs. These floor plans are designated by plant number, 11 to 14 and 15 to 24, inclusive. The dimensions are approximate but sufficiently close to give a good idea as to the shape and size of the plant and the arrangement of departments. Suggested designs are plans 1 to 5, inclusive.

SITE

Nine of the 13 plants studied are located within the incorporated limit of a town and eight were designed as poultry dressing plants. Those located outside the limits of a town are near a town or village. The relatively large number of people needed in a poultry dressing plant, water supply, and sewage disposal makes a town site desirable. Only one plant reported city authorities objecting to dressing poultry within city limits. Plants in towns are usually located in industrial sections where the dressing of poultry creates no more of a nuisance than some other business.

Table 8. - Eviscerating on-the-line and packing soup chickens (fat hens): Operations, equipment used, number of workers, and performance per worker at plant 17.

OPERATIONS	EQUIPMENT	WORKERS	
		OBSERVED	REPORTED FOR CAPACITY
Foreman.....		1	1
Bringing in birds.....	Rack	1	1
Hanging.....	From rack	1	1
Pinning.....	Knife or fingers	1	2
Removing oil sack and crop.....	Knife	1	2
Hanging head and opening.....	Knife	1	2
Drawing.....	None	1	1
Removing vent.....	Knife	1	1
Removing egg sack.....	Eviscerating tools	1	1
Veterinarian.....	None	1	1
Removing lungs.....	Eviscerating tools	1	2
Removing kidneys.....	Eviscerating tools	1	2
Separating giblets from intestines.....	Knife, shears, and fingers	2	3
Cleaning giblets.....	Giblet cleaning table	3	5
Removing head.....	Shears	1	1
Washing body cavity.....	Spray nozzle	1	1
Inspecting.....	None	1	1
Removing neck.....	Shears or knife	1	1
Taking off and removing feet.....	Shears	1	2
Wrapping neck and giblets.....	Table and paper	1	2
Packing.....	Boxes, table, etc.	1	2
Tieing boxes and weighing.....	Binding machine, scales, etc.	1	2
Stenciling.....	Pad, brush, and ink	1	2
Total workers.....		26	39
Birds per hour.....		340	720
Birds per hour per worker.....		13.1	18.5

Ten of the 13 plants studied had land on which to expand in case additions to the plant should be desired. The other three could expand only by acquiring adjacent property, by adding more floors to existing buildings, or possibly by small additions and rearrangement of departments.

In selecting a site consideration should be given to convenience in receiving poultry from the producer and in shipping the finished product. Trucks should be able to get to and from the plant with a minimum of interference from other traffic. Space should be available for employees, patrons, and visitors to park. Land for possible future expansion is also desirable. The initial investment in land may be small when compared with increased operating cost extending over a period of years as a result of cramped quarters.

Table 9. - Eviscerating springs: Operations, equipment used, number of workers, and performance per worker at plant 20.

OPERATIONS	EQUIPMENT	WORKERS	
		OBSERVATION	OBSERVATION
		1	2
Foreman.....	None	1	1
Hanging.....	None	1	1
Pinning.....	Knife and fingers	3	3
Removing oil sack.....	Knife	1	1
Splitting neck.....	Knife	1	1
Removing head.....	Knife	1	1
Removing feet.....	Power saw	1	1
Laying on table.....	None	1	1
Cutting vent.....	Knife	1	1
Removing vent.....	Knife	1	1
Drawing.....	None	2	2
Veterinarian.....	None	1	1
Removing liver.....	Fingers	1	1
Removing neck.....	Knife	1	1
Removing gizzard.....	Knife or shears	1	1
Removing crops.....	None	3	3
Removing heart.....	Eviscerating tools	1	1
Removing kidney.....	Eviscerating tools	2	2
Removing lungs.....	Eviscerating tools	2	2
Inspecting.....	None	1	1
Washing body cavity.....	Spray	2	1
Hanging.....	Rack	1	1
Washing liver.....	Pan, water, etc.	1	1
Washing heart.....	Pan, water, etc.	1	1
Cleaning gizzard.....	Knife, fingers, etc.	5	3
Wrapping giblets.....	Table, paper	5	2
Removing waste.....	Cart	1	1
Total workers.....		43	37
Birds per hour.....		924	710
Birds per hour per worker.....		21.5	19.2

Table 10. - Cutting up and packing eviscerated springs: Operations, equipment used, number of workers, and performance per worker at plant 20.

OPERATIONS	EQUIPMENT	WORKERS	
	HOTEL PACK	OBSERVATION 1	OBSERVATION 2
Loading trays.....	From rack	-	1
Cutting up.....	Knife	-	10
Inspecting.....	None	-	2
Packing.....	Crates	-	4
Weighing.....	Scales	-	1
Stenciling.....	Brush, ink, etc.	-	1
Lining crates.....	Paper and box	-	1
Supplying crates.....	None	-	1
Making up crates.....	Hand tools	-	1
Washing trays.....	Basin	-	1
Carrying trays.....	None	-	1
Checking.....	None	-	1
Sharpening knives.....	Stone and file	-	1
Cleaning - night.....	Hose, broom, etc.	-	1
Total workers.....		-	27
Birds per hour.....		-	750
Birds per hour per worker.....		-	27.8

OPERATIONS	EQUIPMENT	WORKERS	
	INDIVIDUAL PACKAGE	OBSERVATION 1	OBSERVATION 2
Unloading racks.....	Rack	1	1
Loading trays.....	Tray	1	1
Cutting up.....	Knife	8	6
Splitting backs.....	Power band saw	2	2
Weighing.....	Scales	2	2
Adding weights.....	Machine	2	2
Packing.....	Boxes	13	10
Crating.....	Crates	1	1
Making up crates.....	Hand tools	1	1
Stenciling.....	Brush, ink, etc.	1	1
Checking weights.....	Scales	1	1
Washing trays.....	Basin	1	1
Carrying trays.....	None	1	1
Making up boxes.....	None	5	4
Carrying boxes.....	None	1	1
Sharpening knives.....	Stone and file	1	1
Cleaning - night.....	Hose, broom, etc.	1	1
Total workers.....		43	37
Birds per hour.....		884	684
Birds per hour per worker.....		20.6	18.5

The actual acreage needed for a poultry dressing plant depends in part upon the size, shape, and arrangement of the building or buildings on the site. Some plants visited had land only for the building and space for trucks to unload poultry from the farm and load out the dressed birds. One plant with facilities for dressing about 1,500 birds per hour is located on a plot comprising about 2.75 acres. Another dressing about 2,000 birds per hour has about 5 acres. In both cases the acreage could be reduced about 50 percent without interfering with the operations of the plants and provide ample area for the addition of an eviscerating room and refrigeration. Both of these plants were one-story structures.

### TYPES OF BUILDINGS

As previously stated, plants observed in the Midwest are factory type structures of two or more floors. Those in the Northeast are two-story buildings and the Del-Mar-Va plants are generally one story. In cold climates the structures are usually brick, concrete, or concrete blocks. In warmer regions frame structures predominate.

### ARRANGEMENT OF DEPARTMENTS

A person looking for faults around a processing plant is not very popular with either the management or with the crews. However, in order to make improvements the good and bad features in plant design and in the arrangement of departments must be recognized. For this reason, some of the good and the bad features of the several plants studied are pointed out and discussed. Inadequate drainage for the dressing and packing rooms and poor housekeeping are the most common faults.

Plant 11 is well arranged for efficient operations from receiving through packing. The birds move from one end of the plant to the other without back-tracking. Empty batteries are returned to the poultry receiving platform outside the feeding room, and the feeding and holding space is ample. More space could be used to advantage in the dressing and packing rooms, especially in the dressing room. If the width of the wing for dressing had been 58, or even 56 feet wide, instead of 48, dressing could be done under less crowded conditions. The structure housing the dressing and packing department is one and one-half stories and sufficient space is available upstairs for box storage and box make-up. For expansion to include evisceration and refrigeration, a new structure adjoining the packing room could be added making the plant U-shaped. The office is a separate building at plant 11.

Plants 12 and 16 are rather similar in shape and size but differ as to arrangement of equipment and departments. In both cases there is a tendency for congestion across the center of the building, especially at plant 16. The paths in plant 16 followed by batteries of birds received from the farm, those headed for the dressing line from the feeding room, and the empty batteries all cross in the space between the feeding room and the dressing room. The floor area for packing is less than needed.

Receiving poultry at one end of the building at plant 12 relieves congestion somewhat across the middle of the building. The pitch of the roof is such at both plants as to provide storage and box make-up overhead. The office is in a separate building at plant 12, but overhead in plant 16. An outside building is provided at plant 16 for truck storage and repair.

Plant 14 is one of the largest, the most complete, and perhaps the most expensive plant visited devoted exclusively to poultry processing. It is well constructed and compact with space provided for two eviscerating lines. Refrigeration, both sharp freeze and for holding, is included. The boiler room, ample for two 125 hp. boilers, is separate from the processing plant. A railroad siding, not shown in the drawing, is also provided.

The packing room, while large enough for dressed birds, is in the center of all major activities and gives the impression that it is congested. People from the office, visitors, and workmen in going from one part of the plant to the other usually pass through the packing room. While this condition may not affect the efficient operation of the plant, it is a point which should be considered in the design of a poultry dressing plant. The finished product should be exposed as little as possible to traffic from different parts of the plant. However, it is likely that the shape and size of the plot of land used was such as to make the existing arrangement as good as could be devised for such a large plant.

Plant 15 represents a compact arrangement for a plant of the capacity indicated. However, the live poultry and the dressed poultry are too close together. Persons familiar with plant design and operations recommend that the birds move progressively from the dirty (live) to the clean (dressed) ends of the plant preferably on a straight or circular path.

Plant 17 handles poultry, eggs, and some other produce. The plant is rather extensive and complete floor plans would be of little value in connection with this report. Only the rooms used for dressing and eviscerating are shown.

Dressing operations could be improved at plant 17 by rearranging the dressing line so as to hang birds at one end of the room and take them off at the other end. The live birds are moved into the room and the dressed birds taken out through the same door. This is bad, not only because of congestion but because live and dressed birds are brought in contact at times.

The eviscerating room at plant 17 is large and well arranged. The only suggestion which might be made would be another entrance through which to bring in racks of birds. At present all traffic moves through one entrance.

Poultry dressing at plant 18 is a small part of all operations and the floor plan of the dressing room only is shown. The room is not as large

as it might be for wax operators and both live and dressed birds pass through the same entrance.

The buildings for plants 19 and 21 were not originally designed for dressing poultry but they serve rather well for this purpose. The dressing room is small for the volume of poultry processed at plant 19, and both live and dressed poultry pass over the same dock. The movement of the birds, or the flow line, at plant 21 is good.

The slope of the building site for plant 20 is ideal for two stories without freight elevators. Poultry is received, fed, and shackled on the second floor. The first floor or basement is used exclusively for processing. The plant is complete for dressing, eviscerating, freezing, and cold storage. While complete refrigeration facilities are not provided in the building, a large cold storage plant is nearby and may be reached through a tunnel. Additions being made to the poultry plant will make it one of the largest and most complete plants of its kind in the East.

Plant 22 is neat and well constructed of cinder blocks. Due to the lay of the land, and to some excavation, poultry is received on one floor and can be loaded out from the other without the use of elevators. However, with the present arrangement of equipment, the dressing line full of live chickens divides the packing room on the lower floor. The relative position of the receiving platform, storage room, and space for hanging on the second floor leaves little floor area for batteries. In other words, working space and passageways take up much of the total floor area. With the receiving platform at the end and space for hanging near the wall on one side near the end of the building, usable floor area for batteries could probably be increased 50 percent. With such an arrangement, an open space could be provided through the center of the building from one end to the other with batteries lined up at right angles to it on each side for effective use of the entire floor. Such an arrangement would also improve operating conditions on the floor below.

Plant 23 is one of the three big plants studied and has many good features. The light is good, there is plenty of space for all operations, and the birds move from one department to another without congestion. It appears, however, that insufficient thought was given to evisceration and mechanical refrigeration. Large plants will doubtless find it very desirable to be able to supply the trade either with dressed, drawn, or eviscerated birds. Refrigeration is very important in this connection. If the eviscerated birds can be frozen immediately and holding space is provided for several loads of poultry, the plant is in much better position to regulate dressing operations than when no refrigeration is included.

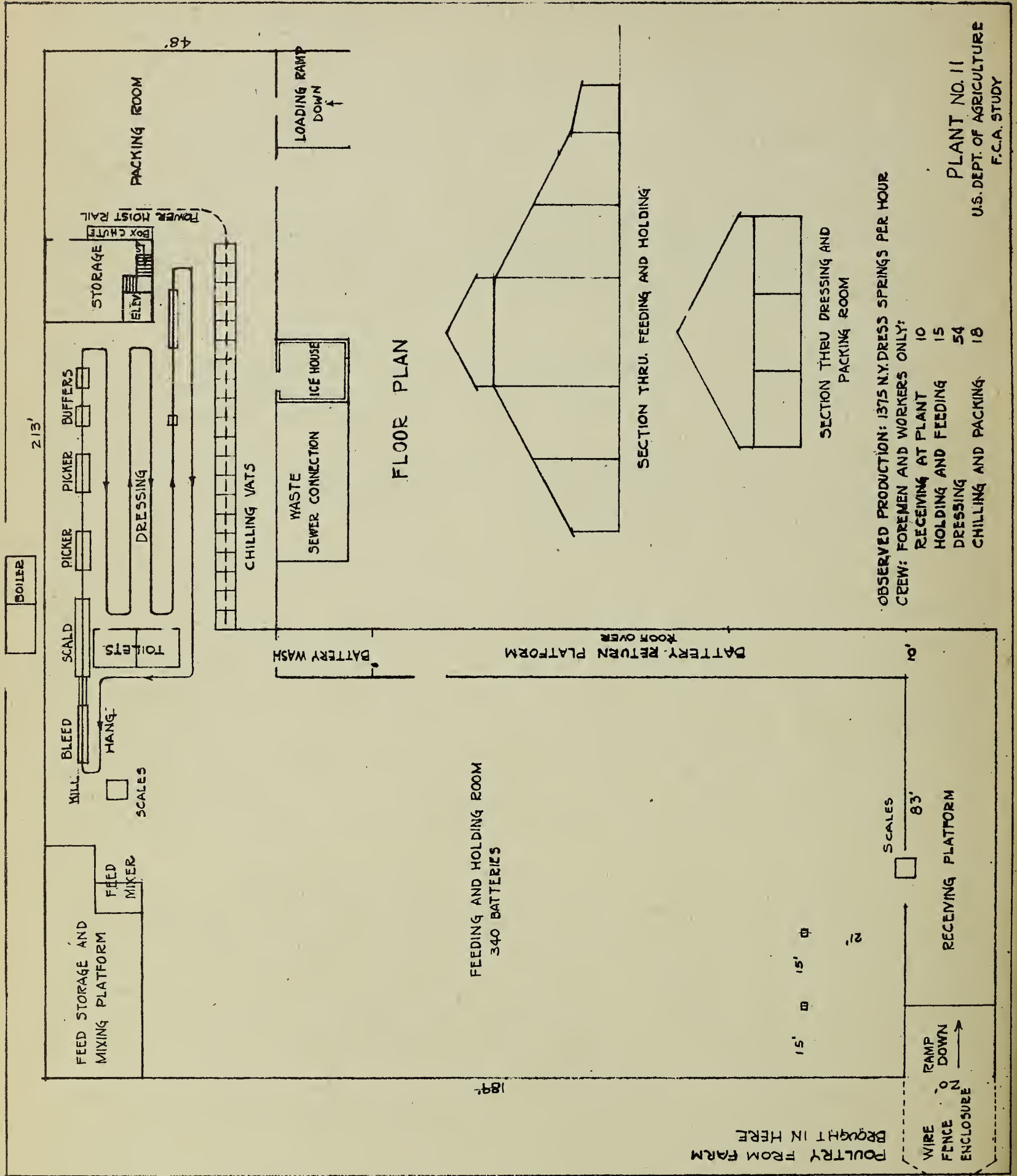
The ideas involved in plant 24 could probably be worked into a standard plant for plants in the Northeast. With some excavating and filling, such a building could be constructed on level land for efficient use of

both floors without the need of elevators. The plan is ideal for a sidehill site.

#### SUGGESTED PLANS

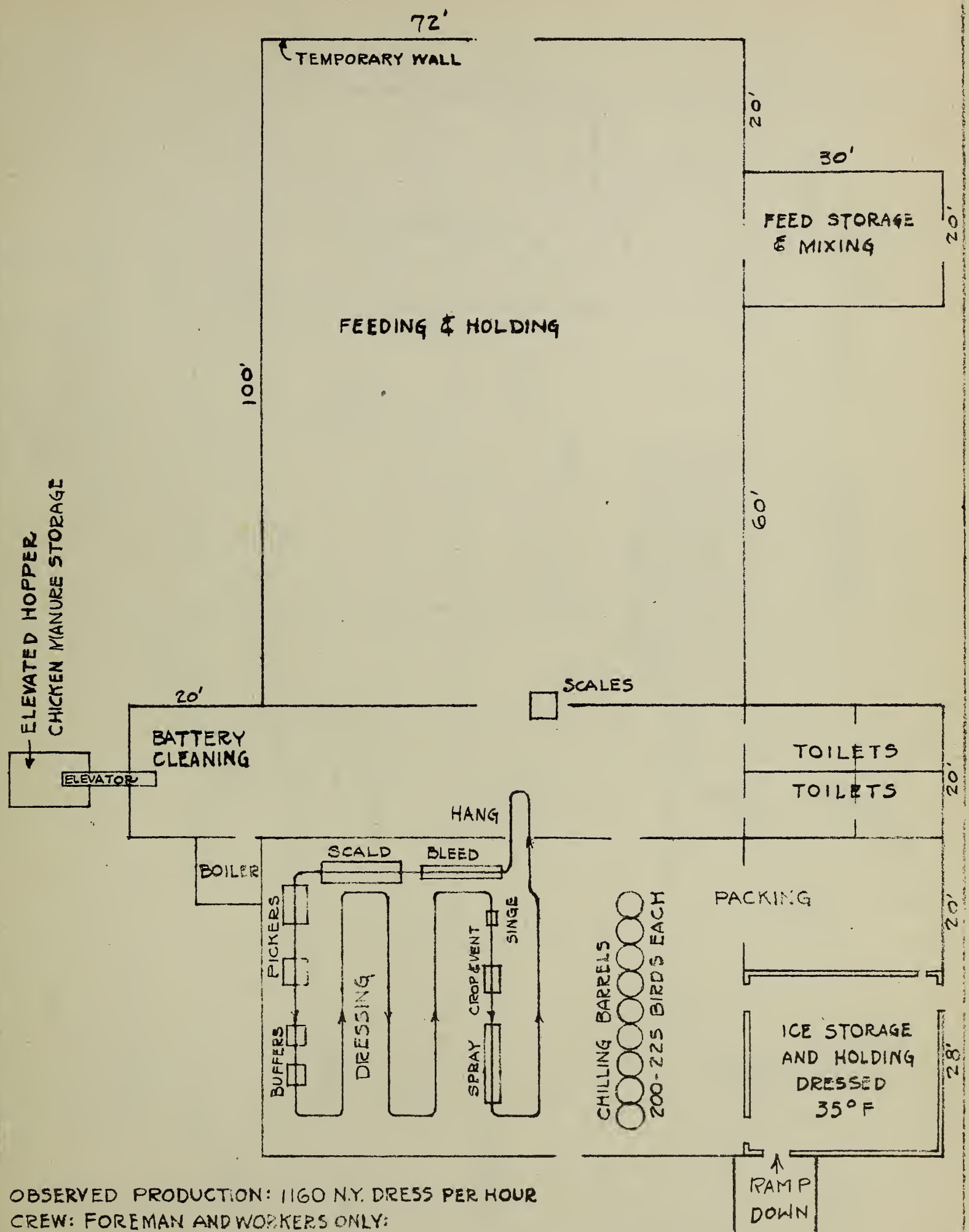
The floor plans of plants included in the study have been reviewed and several layouts suggested. Plans 1 and 2 should be of interest in areas where both poultry and eggs are handled as in the Midwest, or when a room for chilling dressed birds is desired. The layout shown as plan 3 might be suitable for large-scale operations in processing broilers. Plan 4 should be of interest in the Northeast and plan 5 represents about as simple a layout as can be devised for a complete plant with vat chilling for dressed birds.

In plans 1 and 2 a chill room is shown for chilling birds after they have been dressed. It is also large enough for packing the birds for freezing. In the other plans, vats for ice chilling are suggested. On plans where refrigeration is indicated, the chill room is to be used for ice storage and for holding boxes of chilled birds. In all plans where a room is shown for evisceration it is assumed that the birds will be chilled prior to eviscerating.



OBSERVED PRODUCTION: 1375 N.Y. DRESS SPRINGS PER HOUR  
 CREW: FOREMEN AND WORKERS ONLY:

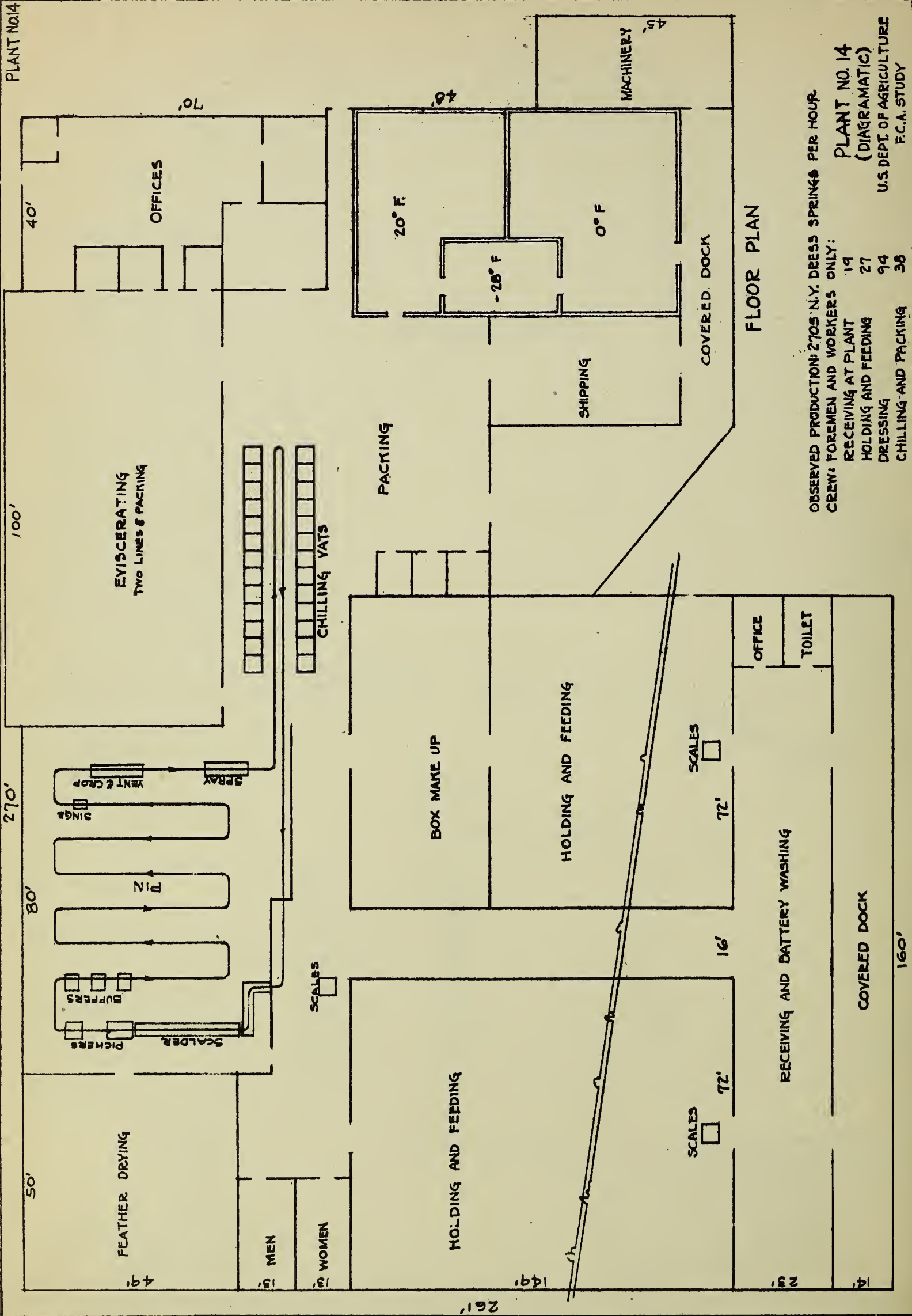
RECEIVING AT PLANT	10
HOLDING AND FEEDING	15
DRESSING	54
CHILLING AND PACKING	18



OBSERVED PRODUCTION: 1160 N.Y. DRESS PER HOUR  
CREW: FOREMAN AND WORKERS ONLY:

RECEIVING	7
HOLDING AND FEEDING	8
DRESSING	47
CHILLING AND PACKING	14

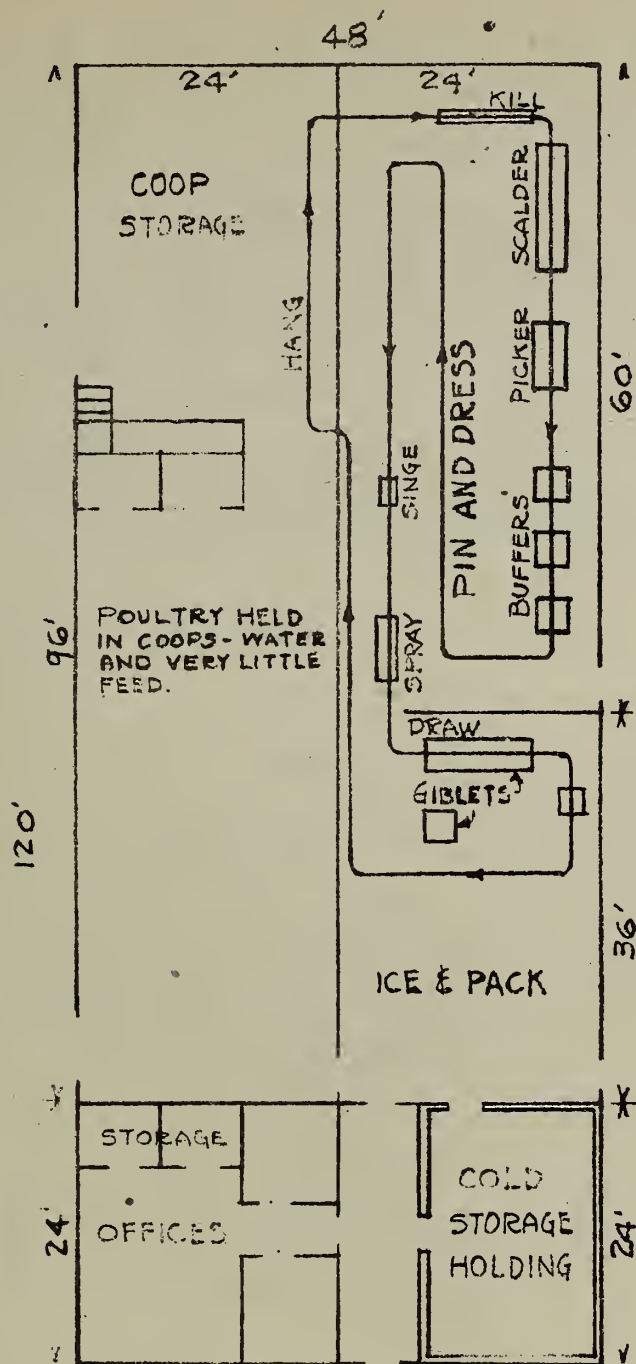
PLANT NO. 12  
U.S. DEPT. OF AGRICULTURE  
F.C.A. STUDY



FLOOR PLAN

OBSERVED PRODUCTION: 2705 N.Y. DRESS SPRINGS PER HOUR  
 CREW: FOREMEN AND WORKERS ONLY:  
 RECEIVING AT PLANT 19  
 HOLDING AND FEEDING 27  
 DRESSING 94  
 CHILLING AND PACKING 38

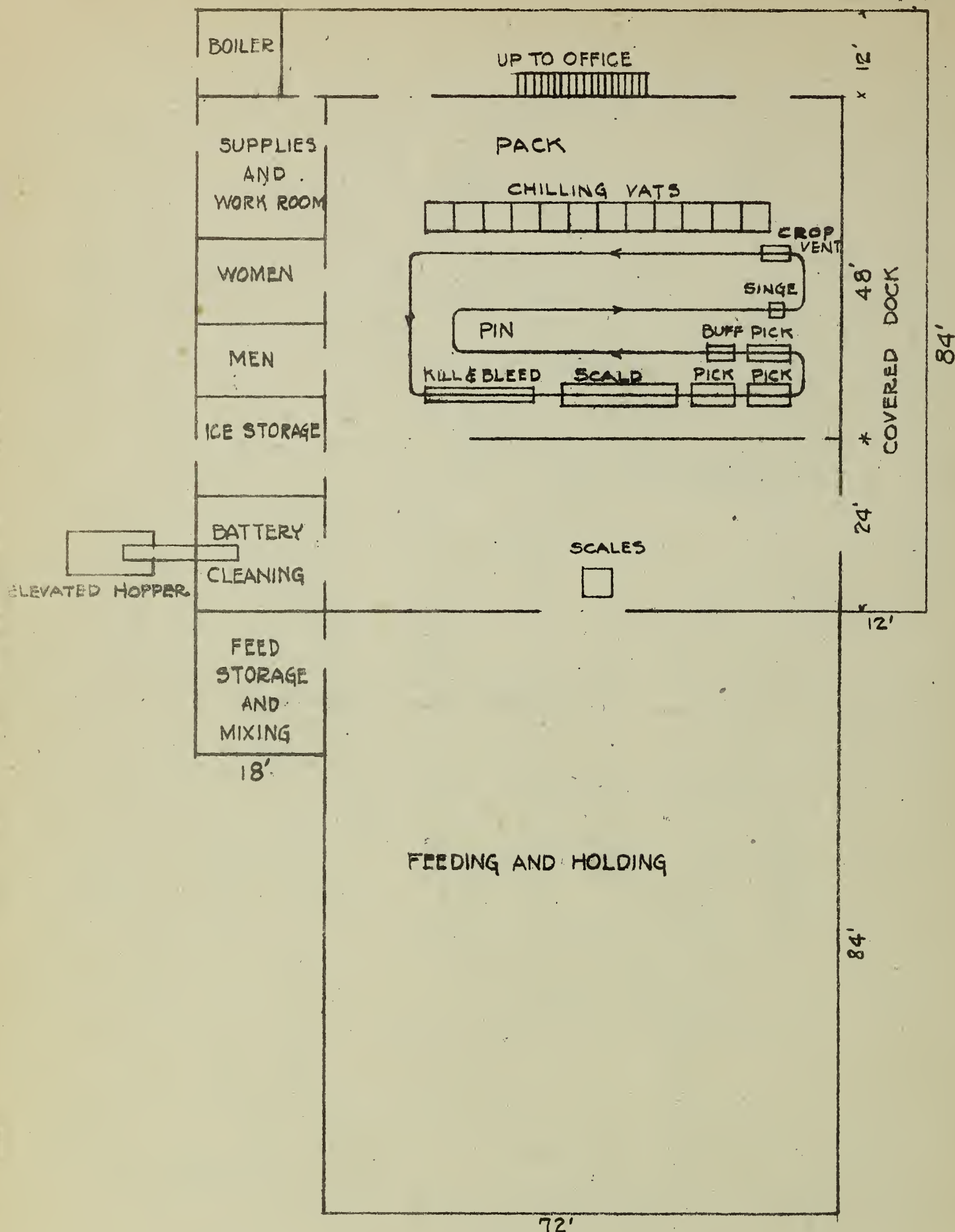
PLANT NO. 14  
 (DIAGRAMATIC)  
 U.S. DEPT. OF AGRICULTURE  
 F.C.A. STUDY



FLOOR PLAN

### DEAWING ON LINE AND PACKING

OBSERVED PRODUCTION: 600 SPRINGS PER HOUR  
WITH CREW OF 36



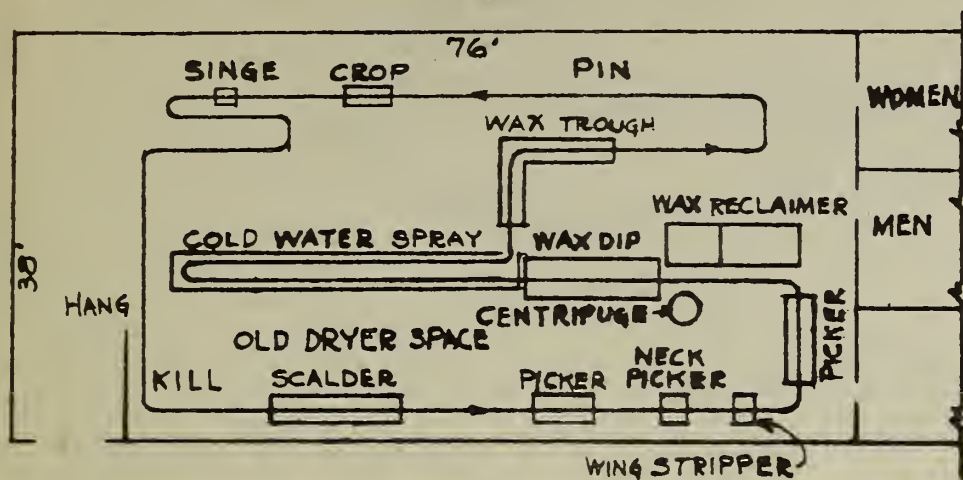
# FLOOR PLAN

OBSERVED PRODUCTION: 1400 N.Y. DRESS SPRINGS PER HOUR

CREW: FOREMEN AND WORKERS ONLY

RECEIVING	—
HOLDING AND FEEDING	7
DRESSING	51
CHILLING AND PACKING	13

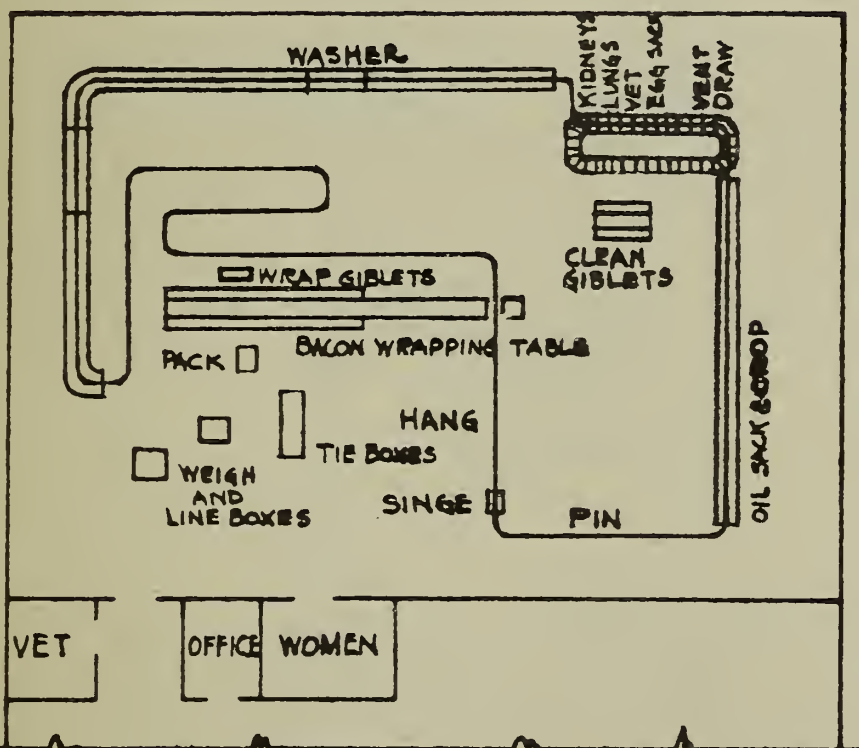
PLANT NO. 16  
U.S. DEPT. OF AGRICULTURE  
F.C.A. STUDY



SCALES

## DRESSING ROOM

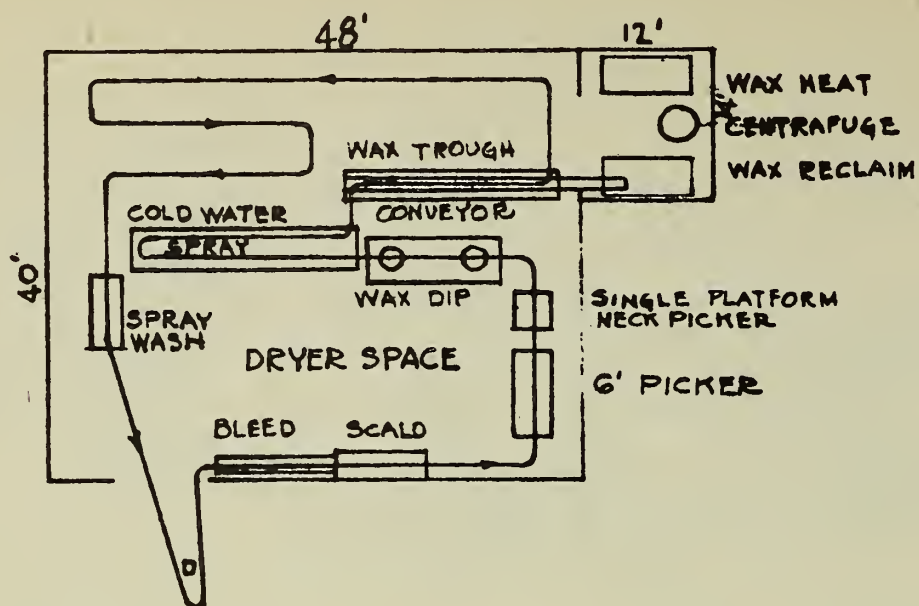
OBSERVED PRODUCTION -  
PART TIME OPERATION:  
550 N.Y. DRESS FOWL PER HOUR  
OBSERVED CREW -  
FOREMEN AND WORKERS ONLY:  
RECEIVING AT PLANT -  
HOLDING AND FEEDING 8  
DRESSING 30  
PACKING -



## EVisCERATING ROOM

OBSERVED PRODUCTION:  
340 SOUP CHICKENS - FAT HENS - HOUR  
CREW OF 26 -  
FOREMEN, VETERINARY AND  
WORKERS ONLY

ESTIMATED CAPACITY:  
720 FOWL PER HOUR  
CREW OF 39



FLOOR PLAN

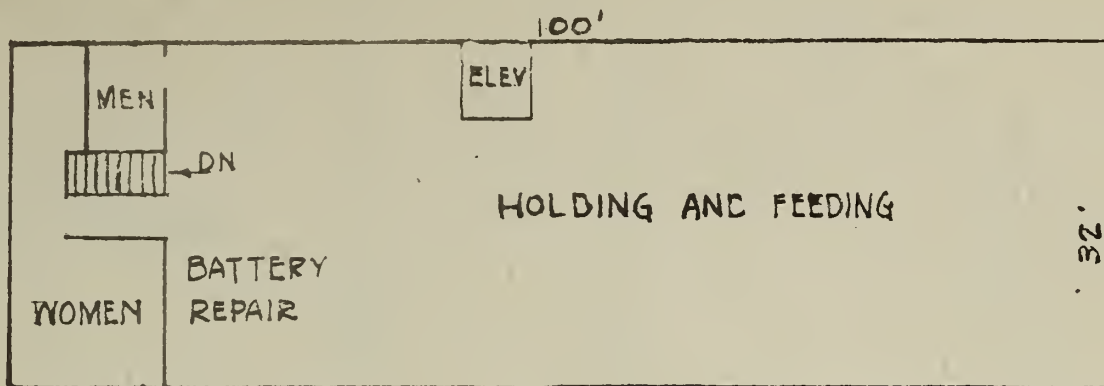
OBSERVED PRODUCTION - PART TIME OPERATION:

850 N.Y. DRESS FOWL PER HOUR

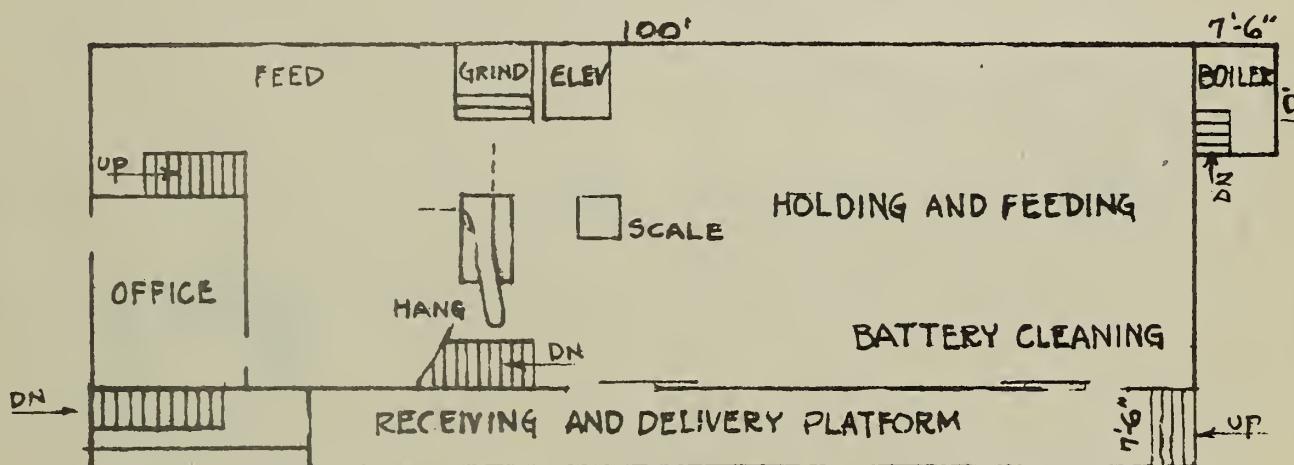
CREW: FOREMEN AND WORKERS ONLY:

RECEIVING	-
HOLDING AND FEEDING	-
DRESSING	39
PACKING	-

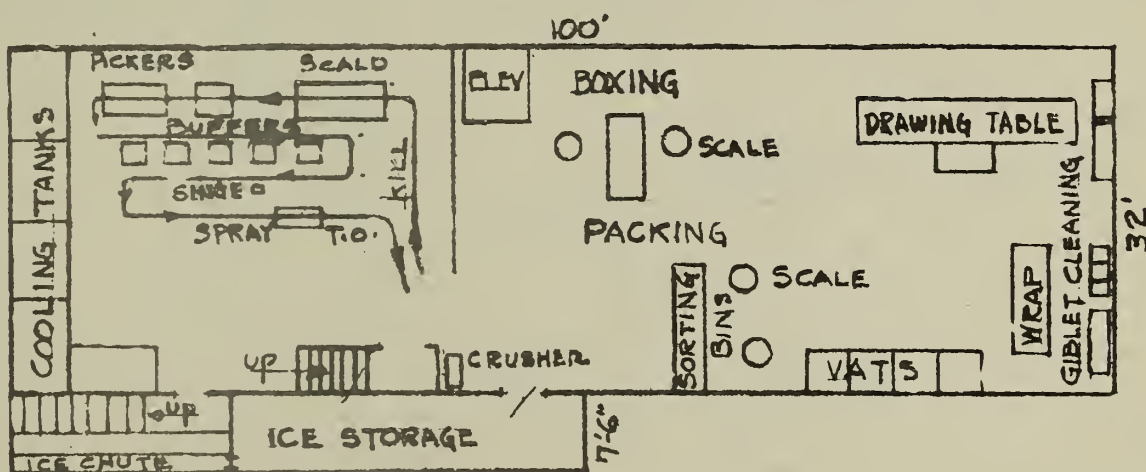
PLANT NO. 18  
U.S. DEPT. OF AGRICULTURE  
F.C.A. STUDY



SECOND FLOOR



FIRST FLOOR



BASEMENT

OBSERVED PRODUCTION: 875 N.Y. DRESS PER HOUR

CREW: FOREMEN AND WORKERS ONLY

RECEIVING	1
HOLDING AND FEEDING	6
DRESSING	45
CHILLING AND PACKING	11

DRAWING SPRINGS ON TABLE AND PACKING:

ESTIMATE, 675 BIRDS PER HOUR

CREW	30
------	----

PLANT NO. 19

U.S. DEPT. OF AGRICULTURE

F.C.A. STUDY

FLAT ROOF ON STEEL JOISTS  
 STEEL COLUMNS & BEAMS  
 CONCRETE FLOOR  
 COLS. 13'-3" FLOOR TO UNDER SIDE OF BEAMS.

FUTURE FEED & HOLDING

HOLDING AND FEEDING

FEED & GRINDING

LOCKERS 20

HANG

SCALES

DESK

LOAD BATTERIES 39'

OFFICE 12'

RECEIVING PLATFORM

FIRST FLOOR

PLANT NO. 20

U.S. DEPT. OF AGRICULTURE  
 F.C.A. STUDY

88'-2"

98'-10"

90'

64'

18

13'

9-6

16

T

S

N

10

20

60'

10

OBSERVED PRODUCTION:

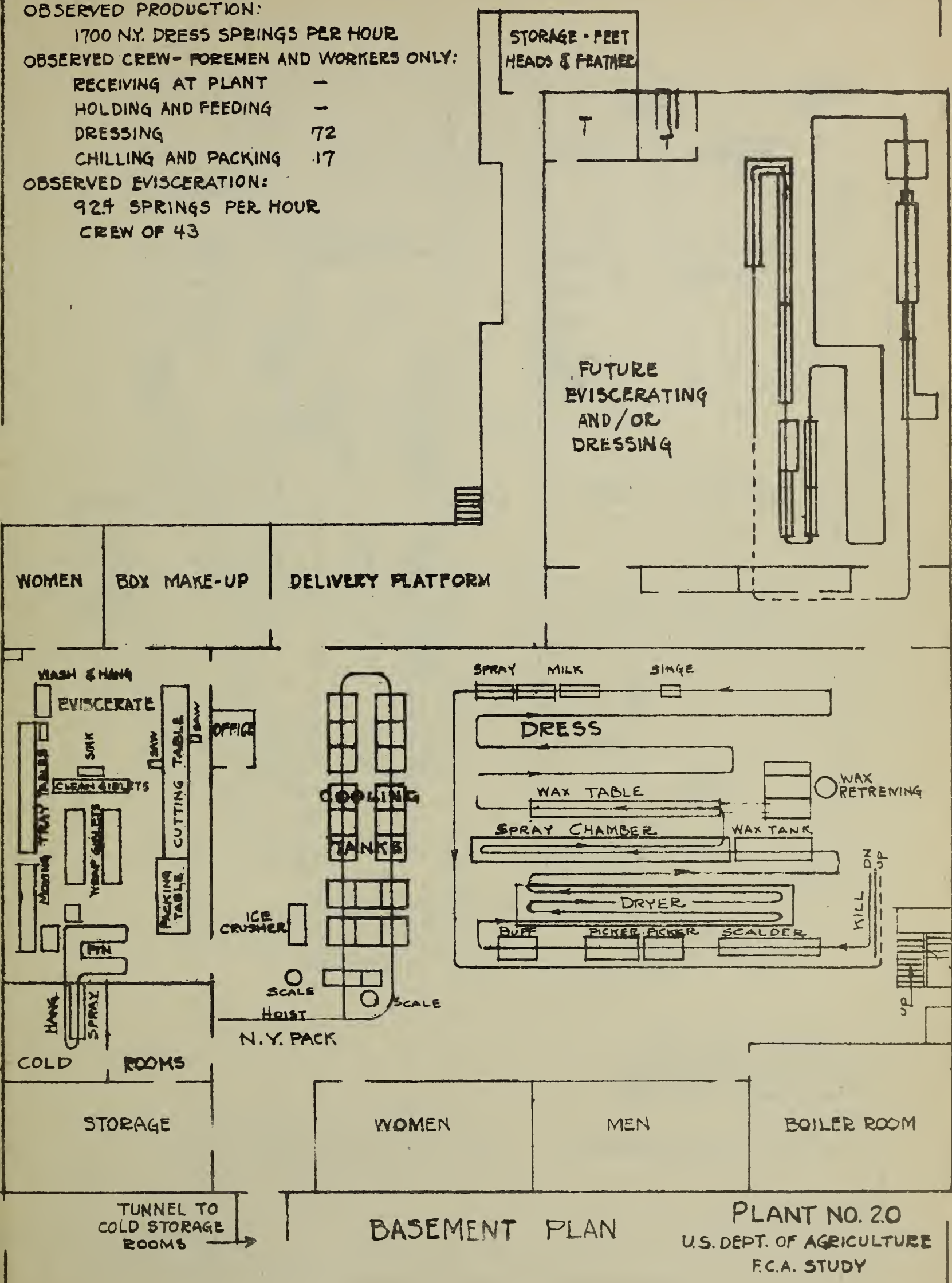
1700 N.Y. DRESS SPRINGS PER HOUR

OBSERVED CREW- FOREMEN AND WORKERS ONLY:

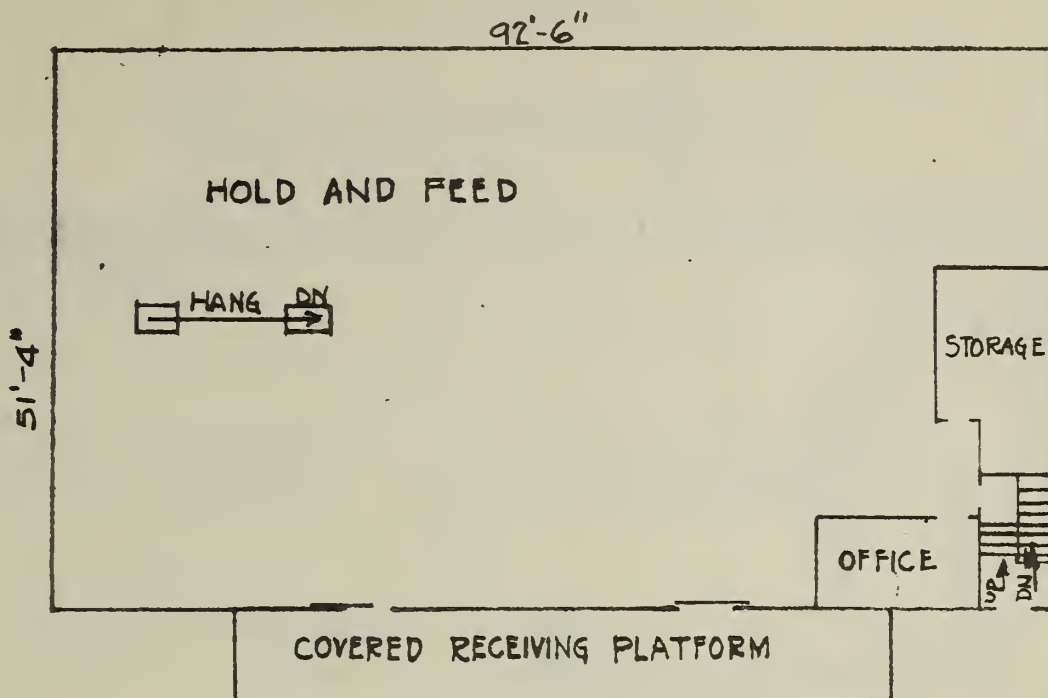
RECEIVING AT PLANT -  
HOLDING AND FEEDING -  
DRESSING 72  
CHILLING AND PACKING 17

OBSERVED EVISCERATION:

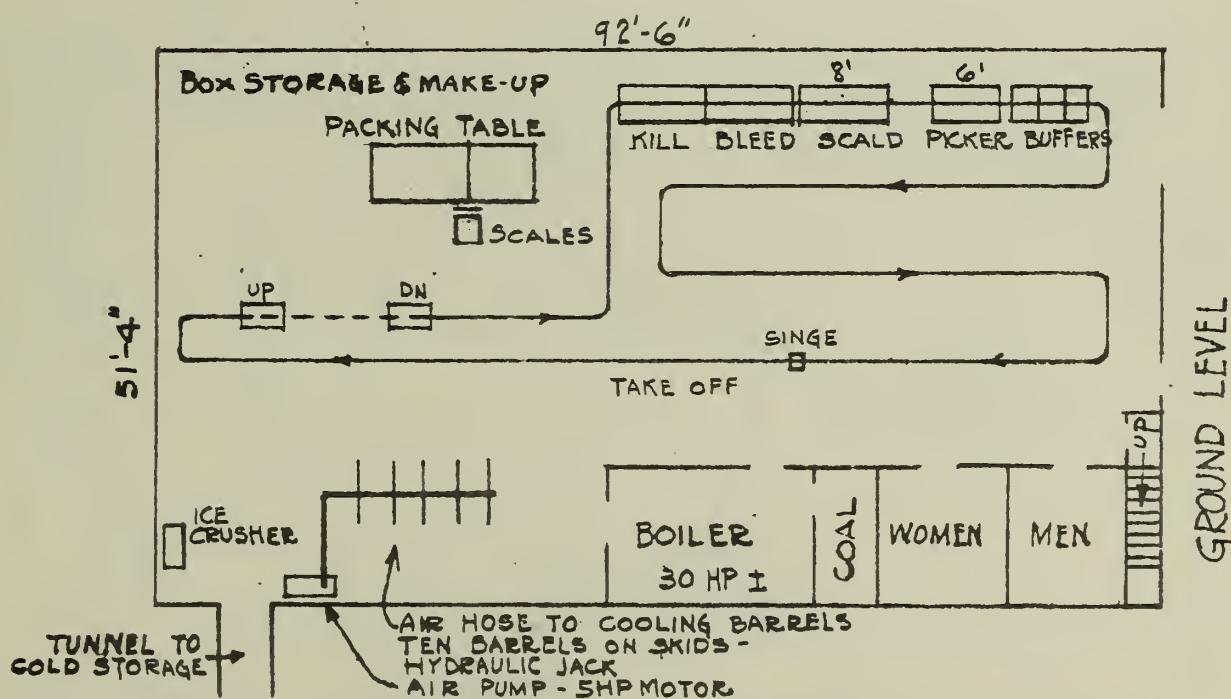
92.4 SPRINGS PER HOUR  
CREW OF 43







## SECOND FLOOR



## FIRST FLOOR - BASEMENT

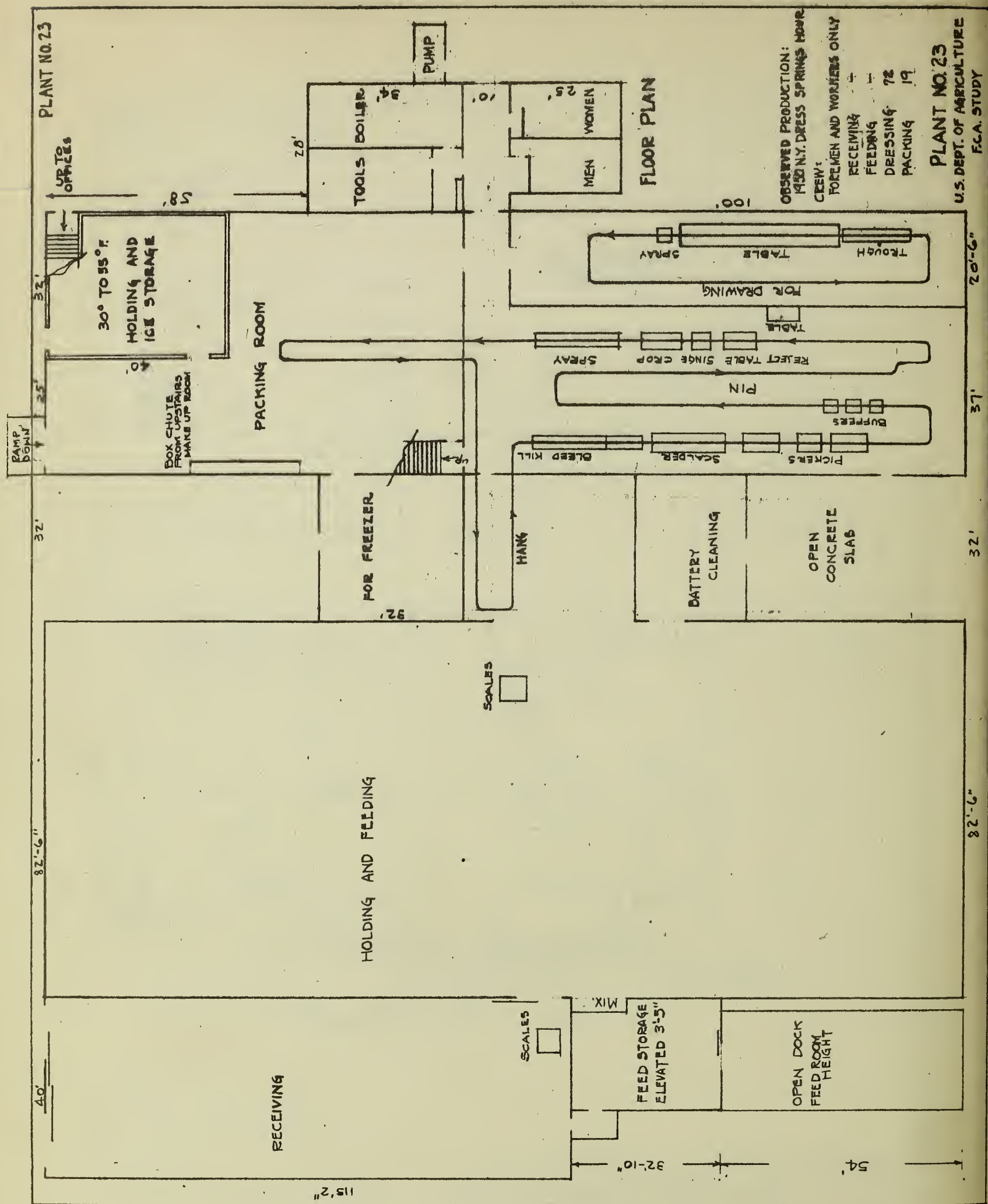
OBSERVED PRODUCTION - PART TIME ONLY:  
400 N.Y. DRESS SPRINGS PER HOUR

CREW - FOREMEN AND WORKERS ONLY:

RECEIVING	}	3
HOLDING AND FEEDING		
DRESSING		25
CHILLING AND PACKING		3

PLANT NO. 22  
U.S. DEPT. OF AGRICULTURE  
F.C.A. STUDY

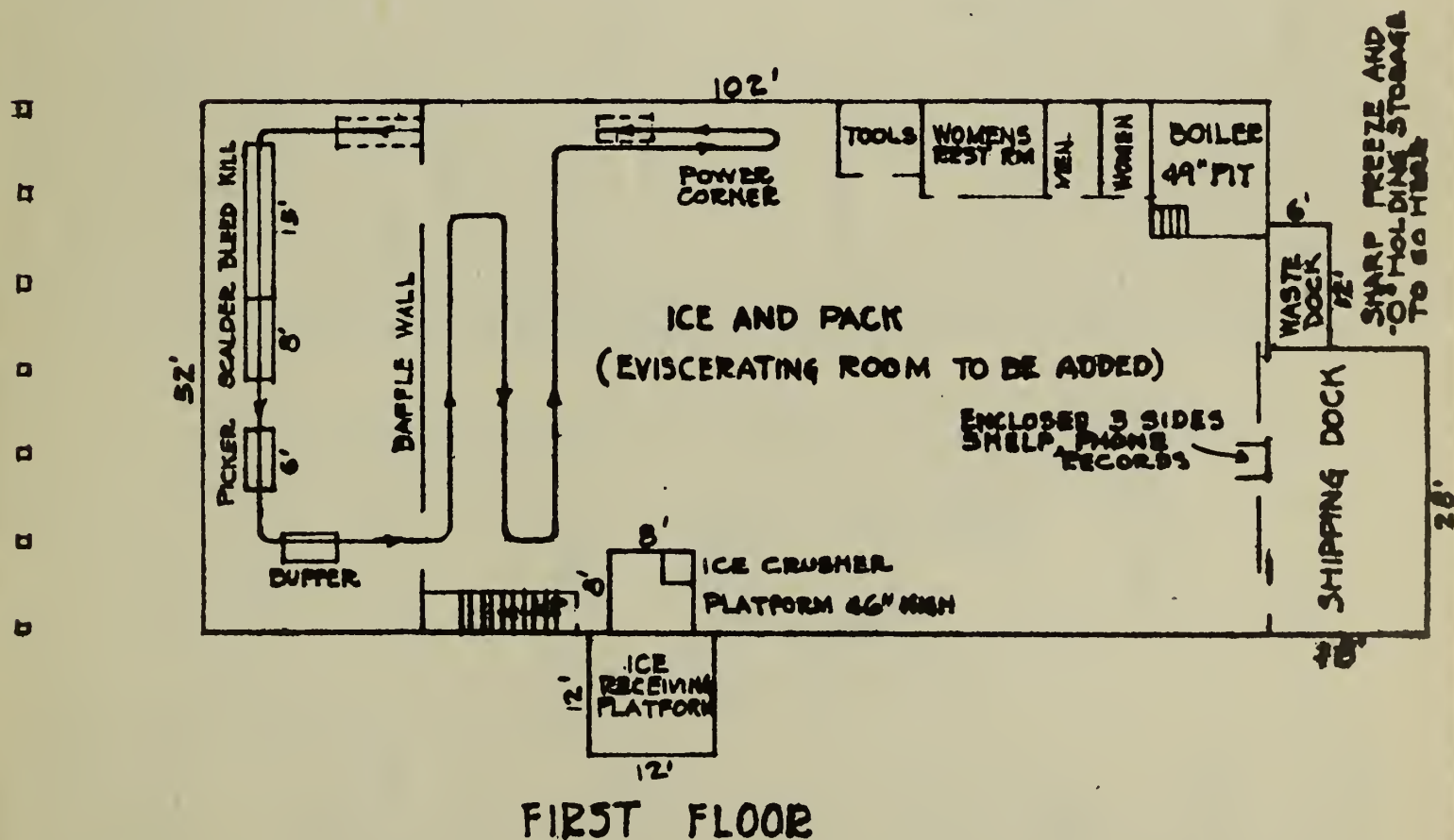
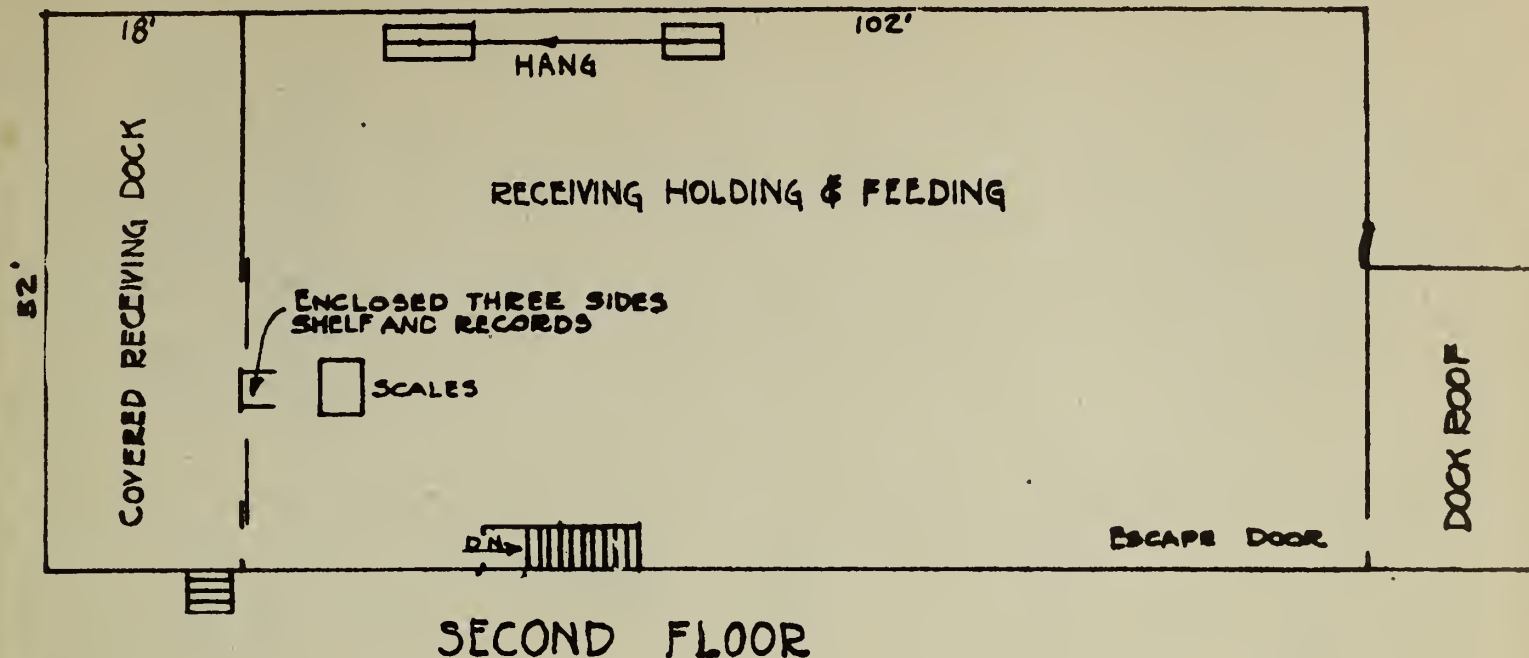
PLANT NO. 23



FLOOR PLAN

OBSERVED PRODUCTION:  
1450 N.Y. DRESS SPRINGS HOUR  
CREW:  
FOREMEN AND WORKERS ONLY  
RECEIVING 4  
FEEDING 1  
DRESSING 72  
PACKING 19

PLANT NO. 23  
U.S. DEPT. OF AGRICULTURE  
FCA. STUDY



OBSERVED PRODUCTION- PART TIME OPERATION:

350 N.Y. DRESS SPRINGS PER HOUR

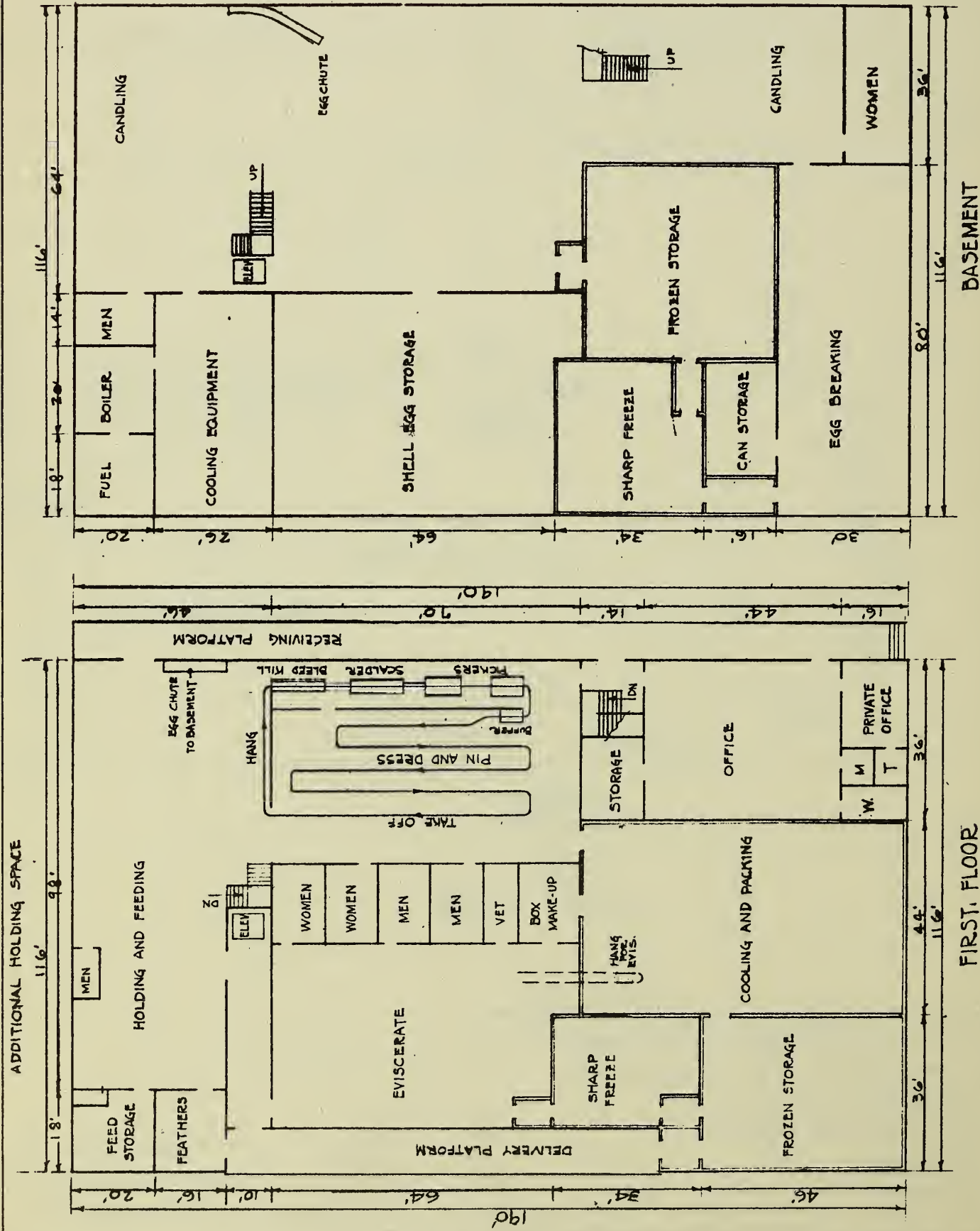
CREW - FOREMEN AND WORKERS ONLY:

RECEIVING AT PLANT	}	3
HOLDING AND FEEDING		
DRESSING		16
PACKING		3

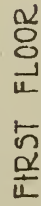
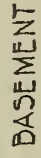
PLANT NO. 24  
U.S. DEPT. OF AGRICULTURE  
F.C.A. STUDY

# POULTRY PROCESSING AND EGG HANDLING PLANT

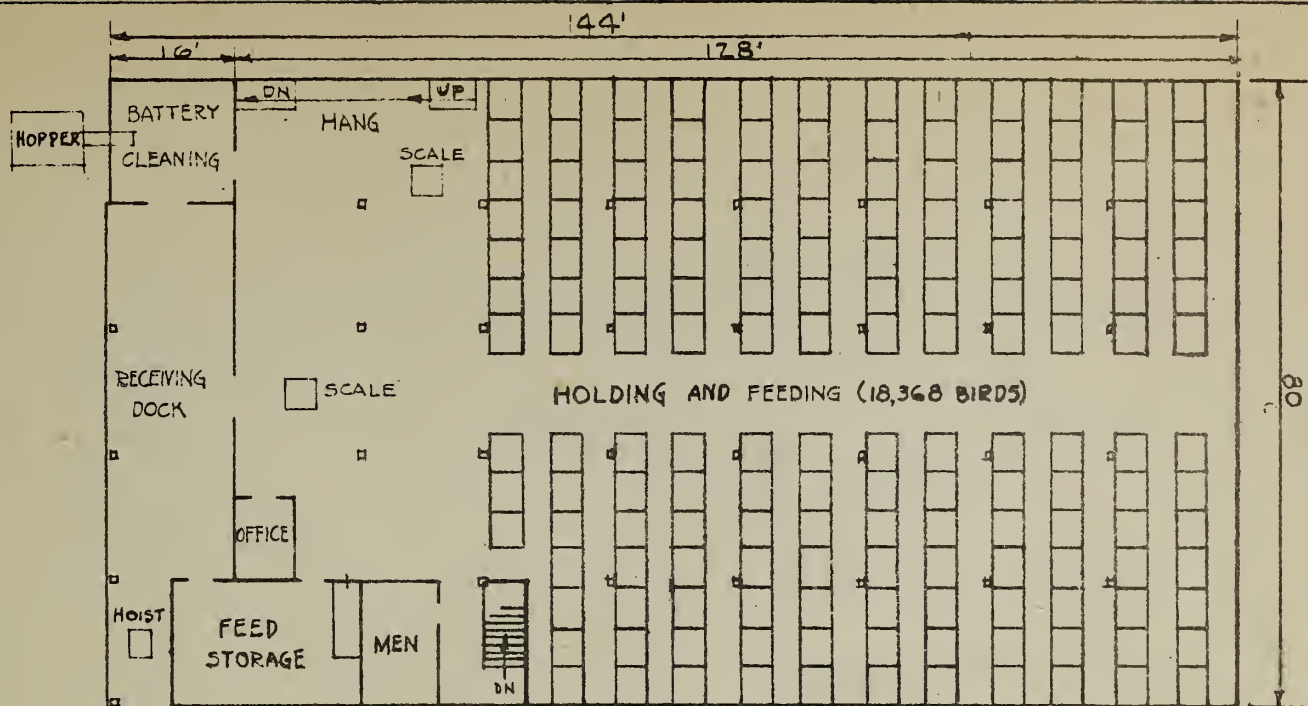
PLAN NO. 1  
April, 1946



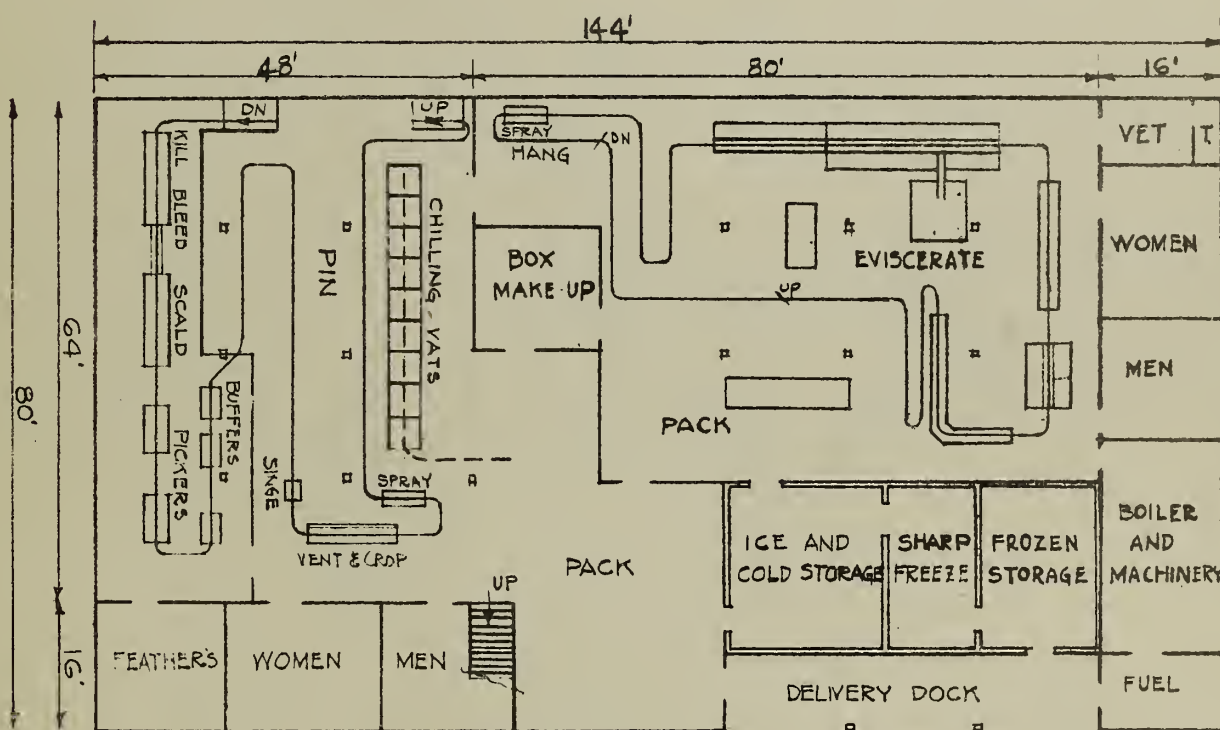
AN NO. 2  
April 1946







SECOND FLOOR PLAN



FIRST FLOOR PLAN



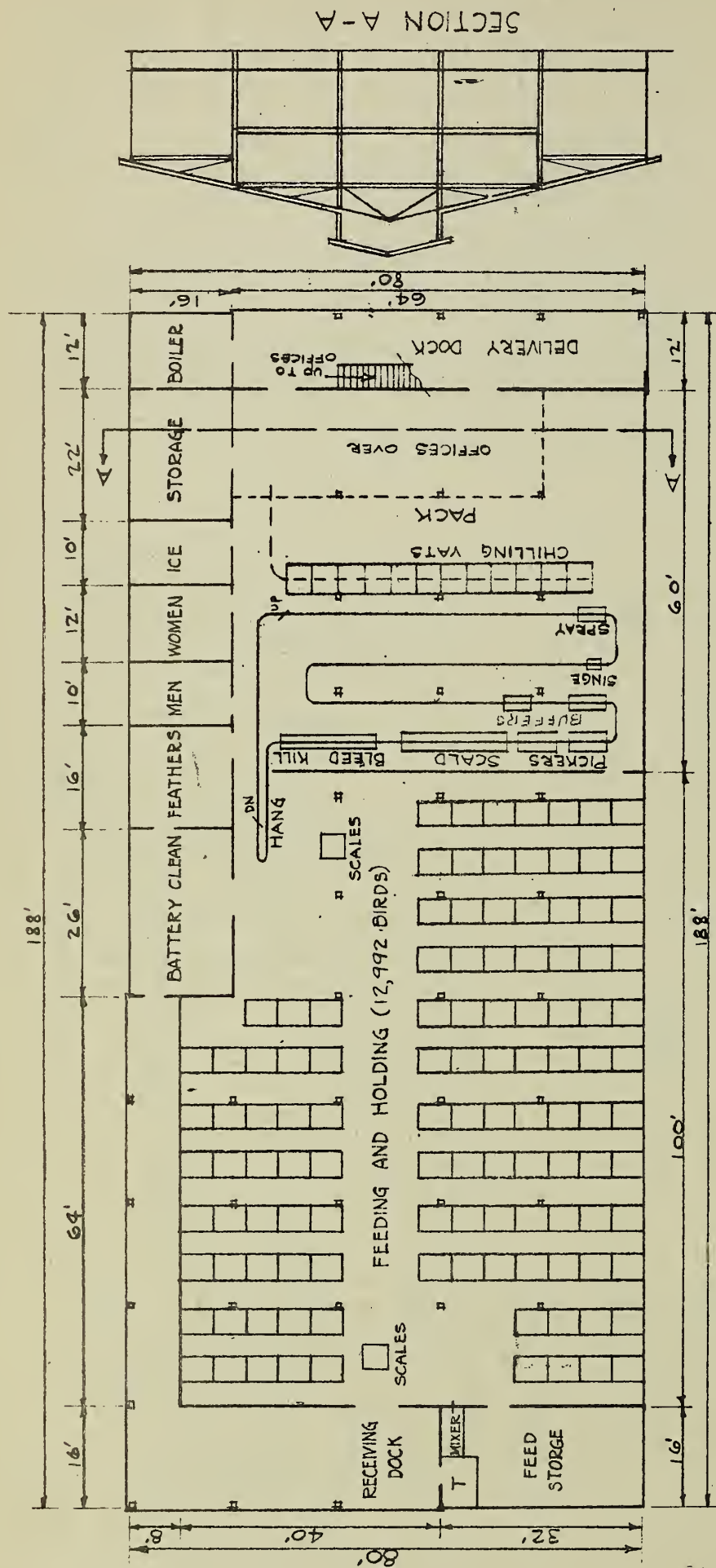
ELEVATION

U.S. DEPARTMENT OF AGRICULTURE  
BUREAU OF PLANT INDUSTRY SOILS  
AND AGRICULTURAL ENGINEERING  
IN COOPERATION WITH  
FARM CREDIT ADMINISTRATION

POULTRY PROCESSING PLANT

PLAN NO.4

April, 1946



FLOOR PLAN  
(All Bays 16' x 16')

U. S. DEPARTMENT OF AGRICULTURE  
BUREAU OF PLANT INDUSTRY SOILS  
AND AGRICULTURAL ENGINEERING  
IN COOPERATION WITH  
FARM CREDIT ADMINISTRATION

POULTRY PROCESSING PLANT.

PLAN NO. 5

April, 1946



